NEW ZEALAND
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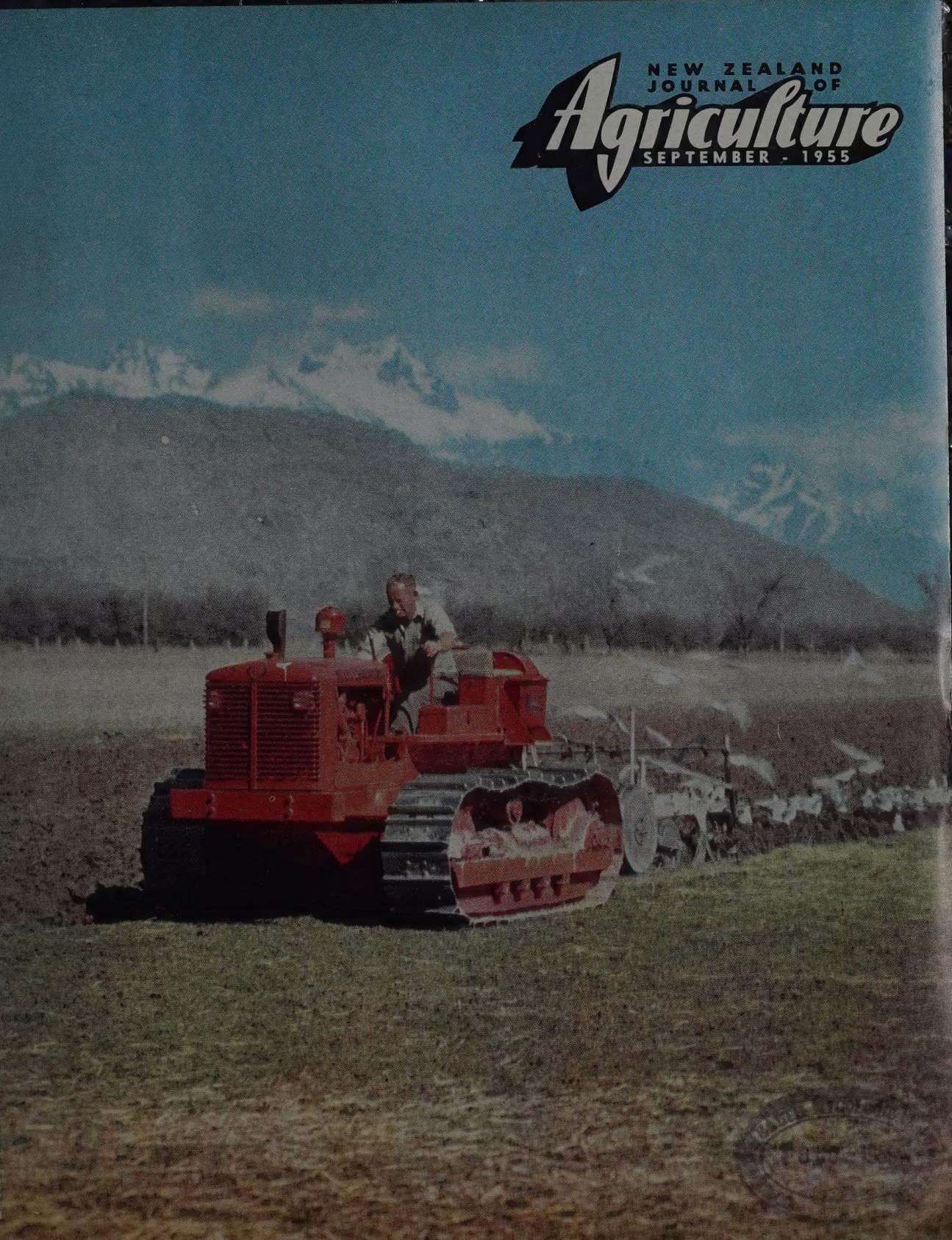

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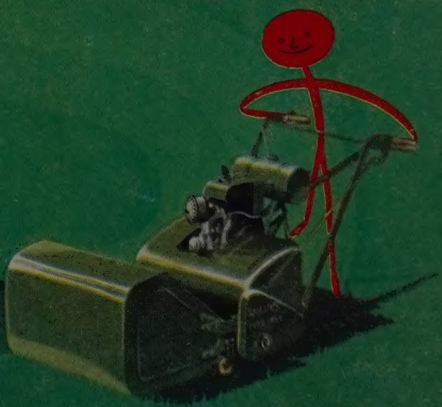

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This Month's Cover

Spring ploughing on a farm near Queenstown, Central Otago, is the subject of this month's cover, which has been reproduced from a colour photograph by R. V. Francis Smith. The ground is being prepared for a crop of peas, which with barley, wheat, and oats are grown in certain parts of Central Otago. Such cropping is usually associated with sheep farming and on irrigated areas with the fattening of lambs and some cattle. In the background of the illustration are Cecil and Walter Peaks, which rise above the western shore of Lake Wakatipu.

TABLE OF CONTENTS

The Home Garden	A. G. Kennelly	226
Importance of Adequate Bee Combs	D. Roberts	239
The Menace of Nassella Tussock	J. W. Woodcock	241
Fodder Beet for Pig Feeding	A. Longwill	245
Meteorological Records for July		252
Poultry Housing Requirements in the North Island	S. G. Haddon	253
High Contents of Soluble Salts in Soils Cause Decline in Yields from Glasshouse Tomatoes	K. J. McNaught	258
Show Dates		264
How American Foul-brood Disease Can Spread	L. A. Griffin	265
Care of Livestock during October		270
Dairy Produce Graded for Export		270
The Potato Crop: Hill Country Pasture Management (Seasonal Notes)		271
Beets are a Valuable Source of Fodder for Stock	J. H. Claridge	272
Radio Broadcasts		274
Wool Shed Design and Construction	J. E. Duncan	275
Flushing Ewes in South Auckland	J. E. Bell	293
Shelter for Horticultural Crops in Hawkes Bay	C. L. Napier	297
Recent Research Work: Minor Elements		305
Trees on the Farm: Raising of Tree Stocks	W. H. Jolliffe	307
Advisability of Keeping Male Birds in Household Poultry Flocks		309
The Flower Garden	M. Joanna Lockie and K. H. Marcussen	313
Attractive Cable-stitch Pullover for Schoolboy		320
British County Recipes	Daphne Eilers	321
Girl's Gay Cardigan with Long or Three-quarter Sleeves		326
Synthetic or Cellulose Sponge for Household Use	Eleanor Couston	327
Italian Spaghetti	Lesley Harding	328

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REGISTERED AT THE G.P.O., WELLINGTON, AS A MAGAZINE

October is a Busy Month in the Home Garden

By A. G. KENNELLY,

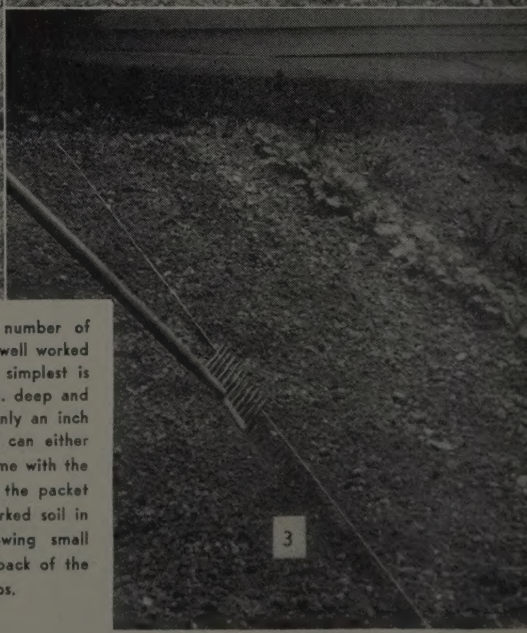
Horticultural Instructor, Department of Agriculture, Dunedin

OCTOBER is one of the busiest months for the home gardener. Though damaging frosts can be expected in some South Island districts until about the second week in November, in most northern districts and in favourable districts elsewhere frost-tender subjects such as tomatoes can be set out and seed of half-hardy and tender subjects such as dwarf and runner beans, sweet corn, cucumbers, and marrows can be sown toward the end of the month. Home gardeners who raise their own autumn and winter cabbage, curly kale, and broccoli plants should sow during the month, or in most districts not later than early November, to have sturdy, well-grown plants for setting out in December or January.

DURING October successional sowings of salad vegetables should be made. Where the ground has warmed enough and frost danger is over seed of half-hardy subjects such as dwarf and climbing beans, sweet corn, melons, pumpkins, squash, marrows, and cucumbers can be sown outdoors a few days before the last damaging frost usually occurs.

Such early sowings should preferably be small, except in the most favoured districts of the North Island, where sowings may begin in late September or early October. Elsewhere ground temperatures are rarely consistently high enough for good growth, and loss or damage to seed, due to factors associated with low temperature, is common.

Jerusalem artichoke can still be planted and in some southern districts it may not be too late early in the month to plant asparagus. Silver beet, lettuce, cabbage, broccoli, and even



1—Peas can be sown in a number of ways, but in light soil that is well worked and well drained one of the simplest is to draw out a drill 2in. to 3in. deep and cover the seed at first with only an inch or two of soil. 2—Fine seed can either be distributed a pinch at a time with the fingers or shaken gently from the packet or a small tin. 3—In well-worked soil in good condition rows for sowing small seed can be made with the back of the rake. Sparrow photos.

brussels sprouts can be set out if the seedlings are ready, and gaps in previously planted rows can be filled. Successional plantings of early potatoes can be made or second-early or main-crop varieties planted, though where well-sprouted tubers are planted shallowly early in the month, they, like those planted earlier, should be kept earthed up to prevent frost damage. Preparation of ground for successional sowings should be continued and the soil can be made ready for the planting out of frost-tender subjects. Successional or main-crop sowings of peas, carrots, beetroot, lettuce, turnips, and parsnips can also be made.

Where the soil is not as rich as desirable, plants such as asparagus, spring cabbage, cauliflower, and silver beet will benefit from a weekly application of liquid manure, which can be made by soaking a quantity of animal manure in a large container of water or dissolving 1oz. of sulphate of ammonia in 2 to 3 gallons of water.

Asparagus

The period during which asparagus can be cut varies greatly according to the bed and may range from 6 to 10 weeks. Research has shown the harm likely to be done to young beds by too early cutting. Only if the growing season is long and the plants well established, should a cutting of not more than 2 weeks be made the third year from time of planting the seed (the second after setting out). In the fourth year the cutting period should not exceed about half the season or about 4 weeks. Thereafter cutting can continue each year for from 6 to 10 weeks according to season of growth and vigour of the bed.

Male plants give a larger yield than female plants, but it is rarely practicable to sort the sexes and discard the female plants, as to do so the plants must be held excessively long in the seed-bed.

Late Autumn and Winter Vegetables

The sowing now or in the near future of seed of broccoli, winter cabbage, borecole, brussels sprouts, and leeks should not be overlooked. Leeks should be sown without delay, but the preferred sowing dates for the others vary a little according to variety and district. If the young plants are ready for setting out during December and January, they attain nearly full development by late autumn without reaching that stage of maturity at which any check or unusual condition of climate will force them into seed development.

The seed-bed for such important crops should be deeply dug and moderately enriched, preferably some time before sowing, with well-rotted organic material such as farmyard manure or compost. A light, easily worked, well-drained soil is best for the seed-bed, and the seed should be sown thinly ½in. deep in rows 12in. apart.

Leeks

The leek varieties Musselburgh and London Flag are two of the many good ones available.

Broccoli

Varieties of broccoli (winter cauliflower) are available that mature or "head in" from late autumn until November. Examples are Michaelmas Early White, Veitch's Self-protecting (early), Mammoth Winter White, Snow's Improved (winter), Lily White No. 2, St. Valentine (spring), Latest of All, and Roscoff in several numbers.

Winter Cabbage

Continuity of supplies of winter cabbage can be assured by planting several varieties such as Ormskirk Early, Drumhead, and Omega. Even the best "holding" varieties do not stand much beyond August in most districts, and provision must be made for a supply of greens such as spring cabbage, broccoli, leeks, or silver beet to follow.

The red or pickling cabbage responds well to treatment recommended for the savoy. Good varieties include Red Dutch and Mammoth Rock Red.

Brussels Sprouts

To extend the period of availability of brussels sprouts a good plan is to make two sowings. One can be made at once and another in a month or 6 weeks. Varieties recommended include Scrymger's Giant, Fillbasket, Long Island Improved, and Cambridge Nos. 1, 3, and 5.

Borecole and Sprouting Broccoli

Except that they are generally harvested later, treatment of borecole (curly kale) and sprouting (non-heading) broccoli is the same as for brussels sprouts. Both are very hardy. They stand well and are among the latest of the winter greens. Good varieties are tender and have a delicious flavour. They are worthy of more general use in New Zealand gardens. Varieties include Borecole, Green Curled; sprouting broccoli, Calabrese, Green Sprouting, and Purple Sprouting.

Beans

Beans are one of the most important vegetables and many kinds and varieties are available. All varieties except broad beans are frost tender and require comparatively warm conditions for germination and growth. In the North Island and in South Island districts not subject to late frost an early sowing of either dwarf or climbing beans can be made from about mid-October to the end of the month according to the district. Whether runner, climbing (pole), or dwarf beans are grown usually depends on the space available. Climbing beans if well grown yield more heavily than dwarf, and the stringless climbing varieties are not inferior in flavour and quality to the best dwarf varieties.

[*Green and Hahn*

Asparagus is not grown as commonly as it might be. The flavour of young shoots is delicious and plants are hardy and once established need little attention.

Varieties of french or kidney beans (*Phaseolus vulgaris*), which are most commonly grown, can be divided into two groups—climbing and dwarfs—which in turn can be divided into tough podded (the pods of which may be tough and leathery when fully ripe) and edible podded (the pods of which are tender and never become very stringy).

The climbing varieties of french beans are annuals like the dwarfs and should be distinguished from the runner bean (*Phaseolus multiflorus*), which is a perennial. Runner beans are not hardier than most varieties of french or kidney beans, but the flowers usually set and develop pods with more certainty where conditions are less favourable and they are therefore largely grown in the cooler parts of the South Island.

Scarlet Runner is the best-known variety of runner bean, but improved strains such as Emperor Scarlet Runner, Princeps, Prizewinner, and Streamline are capable of yielding heavy crops of fine-quality beans which if picked when young from

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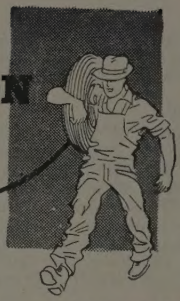

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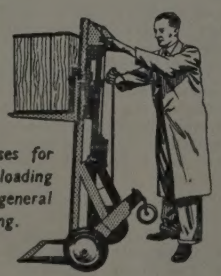

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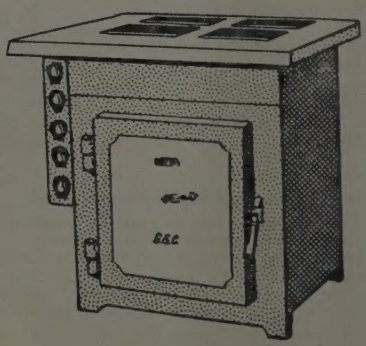

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plants that have been grown in favourable conditions are not inferior to the best-quality french beans. As the runner bean is a perennial, one advantage of growing it is that the roots, which are conspicuously thickened, can be left in the ground during winter if conditions are favourable and the vines will usually yield pods about a fortnight earlier than those from seed sown in spring.

Butter or waxpod beans are stringless varieties of french beans with pale or golden pods. There are tall and dwarf varieties of butter and waxpod, and they should be planted a little later than the ordinary french beans. Good varieties include Pencil Podded Wax and Round Pod Kidney Wax (round-podded varieties) and Woods Centenary (butter) and Sure-crop Black Wax (flat podded).

Thick, fleshy-shelled beans are also known as snap beans, because the pods snap cleanly when bent far enough. Beans are also classed as green shell and dry shell. Green-shelled varieties are flat podded and are generally shelled and eaten like mature broad beans, though the pods of many varieties can be eaten when young like those of snap beans. Dry shell beans are grown and used after the seed is mature or dry. Though the term haricot is given in France to all types of beans except broad beans, in New Zealand it is applied to certain types of dwarf and climbing beans grown for their dry seed. Seed of Black Valentine (Black Prince) is sometimes used as haricot beans.

[Green and Hahn

Kohl rabi is a member of the cabbage family somewhat like the turnip. It can be sown now similarly to turnips and often succeeds where turnips fail.

[Green and Hahn

French and runner beans are not difficult to grow in warm, frost-free situations. A wide range of varieties is obtainable, some of which are high yielding and of splendid quality.

Varieties

Good dwarf varieties of beans include the following:—

Black Valentine, which is heavy bearing with dark green stringless pods about 7in. long. It is often used for second early or main crop.

Masterpiece crops well with straight, stringless pods for early main crop or a late sowing.

Pale Dun is hardier than most varieties and where frosts are not severe it can be sown earlier. It crops heavily with medium length, flat, fleshy pods which develop some stringiness as they reach full size.

Tendergreen crops well and has tender, dark green, straight, fleshy, round, 6in. pods.

Good climbing varieties of beans include the following:—

Fardenlosa, which is largely grown commercially because it crops heavily with straight, tender, fleshy, stringless beans up to about 10in. long.

Market Wonder, another popular variety. It has slightly shorter pods than Fardenlosa, but is not otherwise much different.

Westralia, a useful variety somewhat similar to Market Wonder in cropping. As it appears to be highly resistant to

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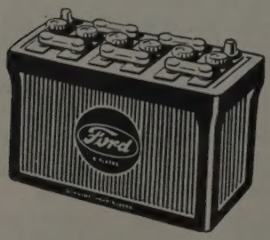

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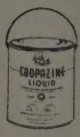

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bean rust, it should be specially valuable in districts, particularly in autumn, where that disease is troublesome. Seed is not yet generally available.

A number of other useful varieties of dwarf and climbing beans are listed in most seedsmen's catalogues.

Where the diseases anthracnose and bacterial wilt are troublesome resistant varieties of beans should be chosen. All runner beans are resistant. The Plant Diseases Division of the Department of Scientific and Industrial Research recommends the following dwarfs as being highly resistant: Burnley selection of Canadian Wonder (not ordinary Canadian Wonder) and Pale Dun. Black Prince, Blue Pod, and Woods Centenary (also known as Speckled Butter and Stringless Kidney Wax) are resistant, but to a less extent.

Beans are very susceptible to frost or low temperatures and can be grown outside successfully only during the warm period of the year. Cold weather or extreme changes in temperature adversely affect pollination of the flowers. Dryness at the roots is also a frequent cause of non-setting of the flowers and it is partly for this reason that sandy soils or soils containing very little humus should be avoided for main crops unless a supply of moisture can be assured. A cold snap or exceptionally hot and dry conditions during the development of the young pods may cause them to curl or hook or even to wither and die.

A good framework for supporting runner beans.

Soil Preparation and Sowing

The soil should be well drained and cultivated before sowing, and though it need not be more than moderately rich in organic material and nitrogen and potash, the addition of phosphates or complete fertilisers rich in phosphates has been found beneficial on many soils where trials have been carried out. Beans are tolerant of moderately acid conditions, but lime should be applied at at least 3oz. a square yard some time before sowing if the land has not been dressed with lime recently.

Climbing beans can be grown in rows without staking by slashing or pinching back excessively long growths, but where growing conditions are favourable best results are obtained if vines are staked or allowed to climb a support. Though it is usually advisable in most districts to make more than one sowing of dwarf beans if continuity of supply is to be assured, most varieties of climbers will continue to bear until cut down by frost if the pods are picked regularly and are not allowed to develop fully. Dwarf beans have the advantage of developing pods earlier, taking about 7 to 9 weeks, compared with about 9 to 10 weeks for most climbing varieties.

Bean seed should be sown 1in. to 2in. deep, but in exposed positions or on soils that tend to dry out a drill 2in. to 3in. deep should first be drawn out and the seed pressed 1in. to 2in. deep (according to whether the soil is heavy or light) in the bottom of it. Dwarf beans can be sown in single rows or double rows 6in. apart, with 2ft. between the rows. Seed should be sown or seedlings thinned to 2in. to 4in. apart; the richer the soil is the greater the distance between plants should be. Runner or climbing beans are usually sown or thinned to 6in. to 8in. apart in double rows about 9in. apart and 3ft. to 4ft. from other vegetables.

Beetroot

Beetroot can be grown in almost any kind of soil of reasonable humus content, provided it is well drained and contains adequate lime and fertiliser. There are three main sorts of beetroot, long red, globe, and turnip rooted, each of which has its particular value.

The turnip-rooted kind is probably preferred for table use, but the globe and long varieties usually give a higher yield and often stand better in dry conditions. Like most root crops beetroot does well in soil that has been heavily dressed with organic manure for a previous crop, though a complete fertiliser should also be applied unless the soil is especially rich.

Seed should be sown ½in. deep in rows 12in. to 15in. apart and seedlings later thinned to 2in. to 5in. apart in the rows. An ounce of seed should sow about 100ft. of row.

Popular varieties include Crimson Globe and Detroit Red.

Carrots

A successional sowing of carrots or the main crop can now be sown as advised in last month's "Journal". Fresh carrots are rich in vitamins and are available in a variety of shapes and sizes. The intermediate or stump-rooted types are probably most popular and when sown thinly on light, free-working soils do not require thinning.

Carrots thrive in deep, rich, well-drained, and well-cultivated soils, but care should be taken when building up the humus content to apply only well-rotted material in limited quantity so that when it is incorporated it forms a homogeneous mass with the soil and is not excessively acid, as otherwise misshapen or forked roots may result. The soil should therefore be well cultivated and, if possible, free from

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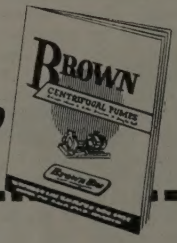

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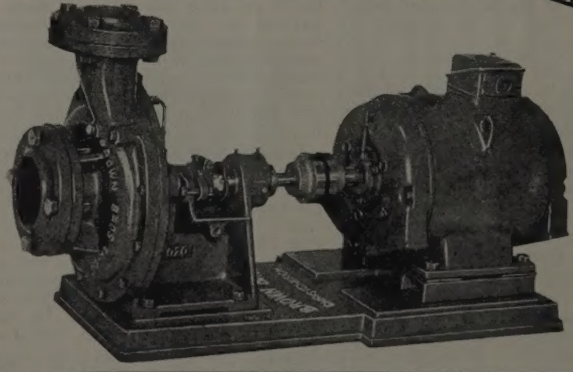

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stones or lumpiness, because if the young taproot encounters a stone, a mass of fertiliser, or a very wet or very dry layer, its normal development is likely to be aborted. Carrots are also likely to split on reaching maturity if (as often happens when the water-table is low) the soil becomes moist after being rather dry for a time. This tendency is usually accentuated by use of a high rate of nitrogenous fertiliser and is most pronounced in the newer, small-cored varieties.

Celeriac or Turnip-rooted Celery

Celeriac belongs to the celery family and may be used either for salads or cooked like other root crops. It has a turnip-like root with a flavour of celery. Its culture is somewhat similar to that of celery, but as it is not blanched and is less exacting in its requirements than celery, it deserves to be grown more extensively in the home garden.

Seed can be sown in rows 12in. to 27in. apart in late September or early October and seedlings later thinned to 6in. to 9in. apart in the rows. Celeriac should be given plenty of water during the growing season and any side shoots that develop on the bulbs should be removed.

Cucumbers

Cucumbers are popular for summer meals. They are easily grown if a warm, sunny spot is available, but are frost tender. An early start can be made by sowing them on a hot-bed or under glass so that the plants can be set out in their permanent positions as soon as frost danger is past.

The seedlings, like those of other cucurbits (marrows, pumpkins, etc.) and sweet corn, do not transplant well. This is mainly because the roots of these crops, unlike those of subjects such as tomatoes, cabbage, lettuce, and beets, are distinctly suberised, that is, covered by a fine, protective, corky layer of material called suberin which slows up their absorption of water and consequently their ability to form new roots quickly. If plants are intended for transplanting, seed should preferably be sown in pots or paper packages; if seed is sown in a box or in the soil of a frame, plants should be lifted carefully with a quantity of surrounding soil before they are too large.

Though cucumbers are grown commercially in some southern districts, the season must be reasonably good for the crop to succeed. However, in sunny situations in home gardens where shelter is available and a miniature hot-bed can be made at each hill success can be assured. Ground in the open must be fairly warm before seed is sown.

Where transplanting is to be done seed should be sown 3 to 4 weeks before the proposed time of planting out. Temperatures for cucumbers should be higher than is necessary for a number of similarly treated subjects. The soil should not be allowed to dry out, but over-watering should be avoided. If planting out is to be done immediately after the date of the last killing frost, plants should be hardened off by gradual exposure to the cooler conditions of the open air a few days before being set out.

Squash, pumpkins, cucumbers, or trailing varieties of marrow can be used to cover an unsightly garden soil and vegetation heap. If there is adequate moisture, they grow well on compost or old manure heaps.

Method of Improving Conditions

If conditions in the open are not as warm as desired, good results can be obtained by taking out about a cubic foot of soil in a warm, sunny, sheltered part of the garden and filling the hole with fermenting manure to within about 3in. to 4in. of the ground surface; the final 3in. to 4in. should be filled with soil in which (or preferably at the sides of which) several seeds or plants are set. More seeds than the number of plants required are usually sown to provide against poor germination. To facilitate watering, the ground surface should be level when sowing is complete.

Seed should be sown ½in. to 1in. deep according to whether the soil is wet and heavy or dry and light or sandy.

Plants can be spaced 18in. apart in rows 4ft. apart, but if the hill system is used and growing conditions are favourable, spacing of the hills should be more liberal, though 3 or 4 plants can be grouped round the edge of each.

Good varieties include Apple, Crystal Apple, White Spine, Moneymaker, Long Prickly, and Stockwood Ridge.

Kumaras or Sweet Potatoes

Kumaras or sweet potatoes are usually propagated by rooted shoots or slips, which can be purchased from seedsmen, usually from about mid-October onward in areas suited to kumara culture.

Alternatively plants for setting out when danger of frost is past can be obtained by starting tubers in August in a sunny position on a hot-bed made from fermenting material such as stable manure which has been prepared so that it ferments uniformly. The heap should be levelled about 18in. high and can be made up in a frame, or it can be roughly squared and a temporary frame built over it. The hot-bed should be covered with about 1in. of sand or soil on which the tubers should be placed close together (but not touching) and covered with 2in. to 3in. of soil. The soil need not be rich, but should preferably be sandy. An additional inch or two of soil spread over the bed when the shoots appear will ensure sturdy, well-rooted plants.

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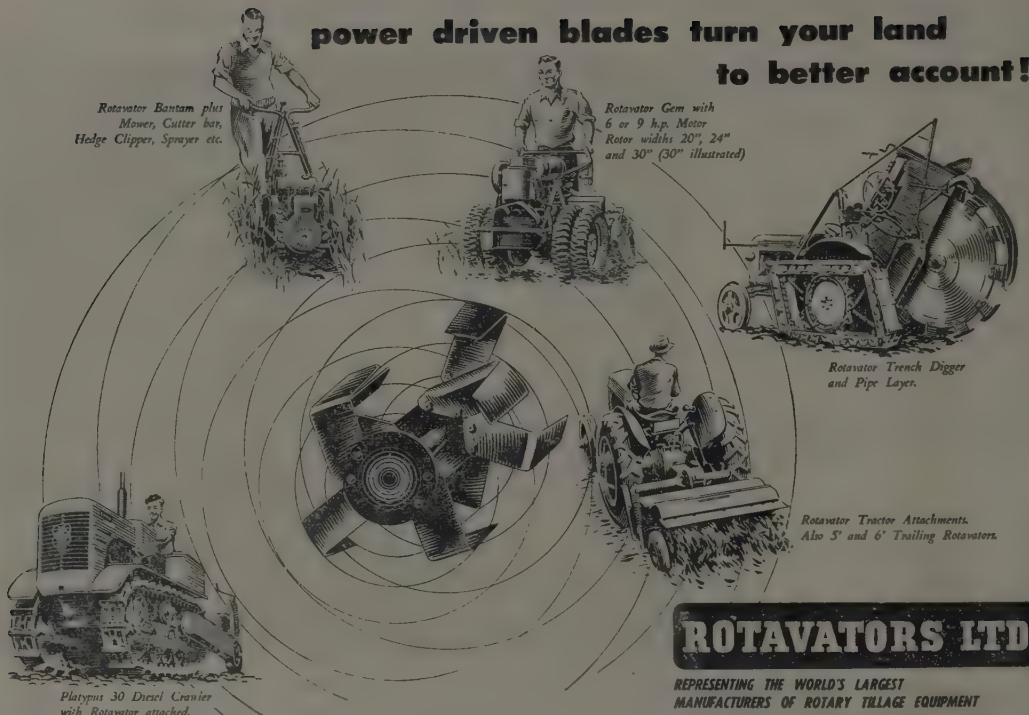

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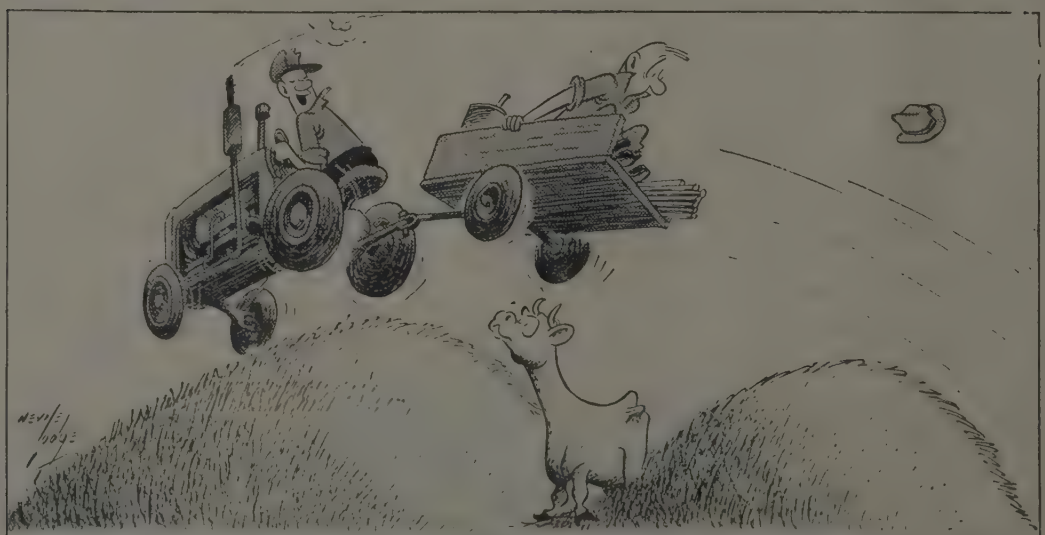

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If the frame is not covered with a sash, protection should be given and heat retained by placing sacking and corrugated iron or wood over it. The covering must be removed as soon as shoots appear on the surface, though protection should be given against frost. Soil temperature should be constant at 65 to 75 degrees F. and watering regulated to give stocky plants that are not easily broken.

About 6 to 8 weeks are required to produce plants for setting out, and during later growth barely enough water should be given to ensure proper hardening of the plants. Shoots part readily and should be pulled carefully when 6in. to 8in. long, the parent root being held in one hand. Additional pullings can be made at intervals if required.

Soil Conditions

The soil for kumaras should be of a type that warms readily, and light or sandy loams are usually preferred. Organic manure applied to a previous crop gives most satisfactory results and in most soils it should be supplemented with a dressing of bone meal or superphosphate, as trials indicate that phosphoric acid requirements are high, though the need for potash seems to depend more on soil type. Very little nitrogen is usually required and an excess causes too much top growth at the expense of tubers. As roots are very sensitive to injury, fertiliser should be well worked along the row a week or two before planting.

Planting can be done on the flat, but in districts in New Zealand where there is no danger of soil drying out it is usually done on broad, low ridges, which warm quickly and facilitate digging. Care should be taken that the rooted shoots do not dry out between lifting and planting. If necessary, they should be puddled in thick muddy water.

In the home garden slips should be set out 16in. apart on the flattened tops of low ridges 24in. apart. Plants, which should be set about the same depth as they grew in the propagating bed are considered to make better tuber development if the rooted portion of each plant is bent up like the bottom end of a J. Plants should be watered when they are set out if conditions are dry. Apart from weed control and the repair of broken ridges, cultivation is unnecessary, though vines are usually lifted occasionally to prevent their rooting, as such rooting appears to favour leaf rather than tuber development.

Though in some seasons kumaras can be grown in warm, sheltered areas as far south as Christchurch, their culture commercially is confined to northern parts of New Zealand. They are classed as a tender to very tender crop. Though they can be dug in the home garden where conditions are favourable about 3½ months after planting, results are usually better if they are left, as they gain rapidly in total yield as they near maturity and the table quality of mature tubers is better than that of immature ones. Tubers can be dug when the skins are reasonably firm or can be tested by cutting. When they are cut mature tubers dry rapidly on exposure to the air.

[*Sparrow*

Kumaras planted on low ridges, which warm quickly and facilitate digging.

Lettuces

Lettuces thrive in cool, fertile, well-drained soils and, if suitable varieties are chosen, it is possible in most home gardens to harvest them throughout the year. Plant breeders have produced varieties that have shown remarkable adaptation to hot, dry conditions and this is a particularly favourable development, as it is in the warmer weather that lettuce is so popular as a salad vegetable. Lettuce is a fair source of vitamins B_1 and B_2 as well as calcium and iron and it contains some vitamin C; because it is eaten raw, it loses little of its food value during preparation for the table.

The soil should be rich in organic matter, and as the seed is small and germination relatively weak, cultivation should be thorough. Fairly heavy applications of organic manure are advisable on most soils, but very rapid growth as the result of too much nitrogenous manure being available may be conducive to the development of tipburn (dying back of leaf edges).

The soil must retain its moisture well, but drainage should be good and on areas that are inclined to be wet lettuce should be grown on a raised bed. Fertiliser recommendations vary greatly according to soil types and conditions, but on soils where insufficient rich organic manure is available a fertiliser containing nitrogen, phosphorus, and potash is recommended. As the plants should be kept growing steadily, side dressings of nitrogenous fertiliser such as sulphate of ammonia, nitrate of soda, or dried blood may be advisable.

Hearting lettuce is difficult to grow well in winter where the ground is very cold, but under cold conditions early crops can be grown by sowing the seed in a box in a frame or cool glasshouse and transplanting the properly hardened-off plants to the field when soil conditions improve. Plants are usually set out from early sowings, but later, when conditions become hot and dry, it is often better to sow seed thinly ¼in. deep in rows 12in. apart and thin the plants to 8in. to 12in. apart in the rows.

Varieties

Good varieties for sowing in October include Imperial 847 (summer), Imperial 44, Neapolitan (Webbs or New York), and Great Lakes.

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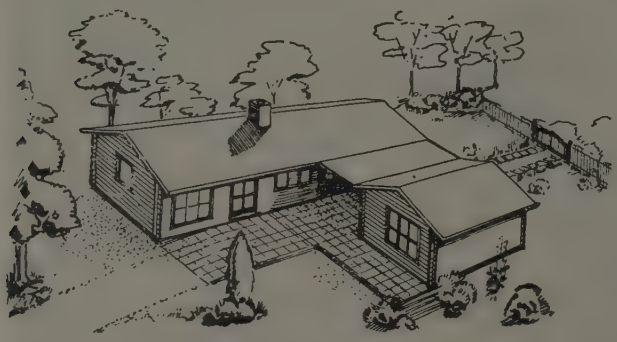

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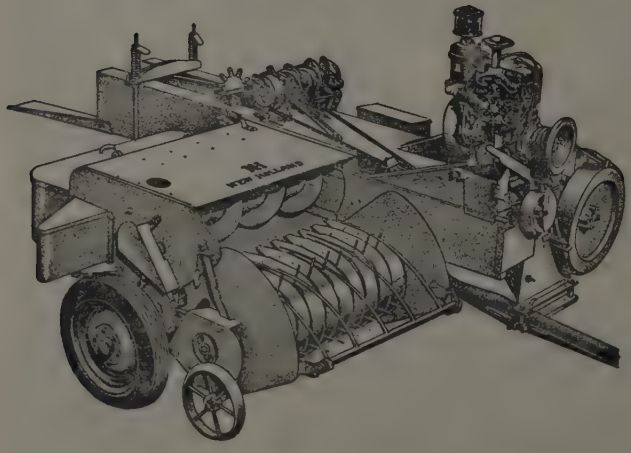

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Onions

In most South Island districts it is usual to sow main-crop onions in September. If this has not been done yet, a sowing should be made without delay as advised in last month's "Journal". Established crops should be kept cultivated and weed free.

Parsnips

In southern districts October is the preferred month for sowing parsnips, though sowing can be delayed until November or December or even later in districts which experience a long season of growth. Parsnips are a fair source of vitamins B_1 and C. They are high yielding and when well established in moderately rich, well-drained soil they require little attention. Probably their greatest value lies in their use as a winter vegetable, as they stand well. Provided the soil is well drained, they rarely suffer much harm, even if left in the ground in the severest winters.

Parsnips are sensitive to soil acidity and in most gardens the ground where they are to be sown should be dressed with lime at at least 3oz. to 4oz. to the square yard if a dressing has not been applied within the last year. In high-rainfall areas the rate should be increased considerably.

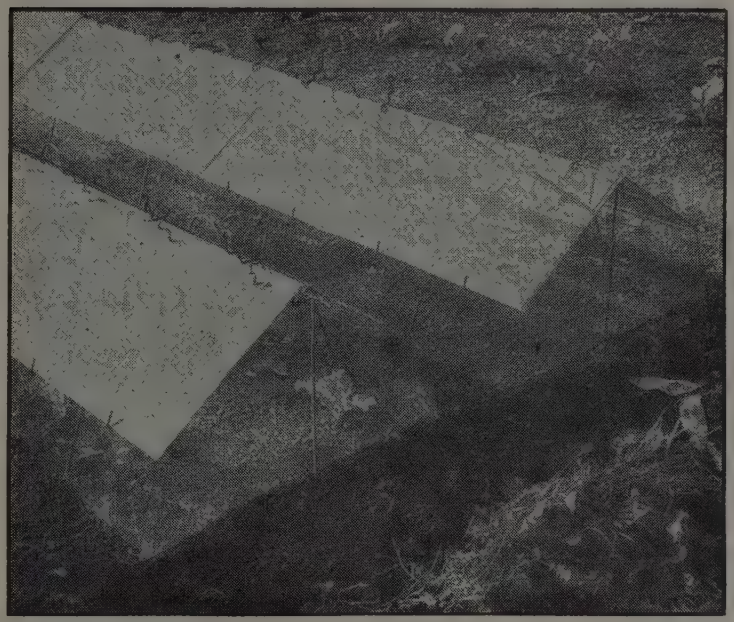
Like most other succulent, taprooted vegetables parsnips should be kept growing steadily if they are to be of good quality and yield well. A deep, friable, well-drained, deeply cultivated soil well supplied with humus is best. Parsnips do best in soil in which organic manure has been applied to the preceding crop, though satisfactory results can be obtained if manure is applied in moderation and is well rotted and thoroughly incorporated in the soil before sowing.

Where organic manure is not available compost or a green crop should be dug in and supplemented with a fertiliser containing nitrogen, phosphorus, and potash. Local experience must determine the actual ratio, but on most soils a mixture that is high in phosphorus and relatively low in nitrogen is likely to be most suitable.

For the production of long, straight roots the ground must be dug to a depth of 2ft. or more unless it is very loose and open. This entails too much work for the average home gardener and the method sometimes adopted is to make holes with a crowbar 9in. to 12in. apart and fill them with fine, suitably prepared soil (potting soil is suitable). After the soil is firmed 4 or 5 seeds are sown in each hole, as germination of parsnip seed is usually poor. Only the strongest seedling from each hole is left after seed has germinated.

Peas

Successional sowings of peas should be continued as advised in last month's "Journal". Some of the best varieties include Greenfeast, William Massey, Little Marvel, and Victory Freezer.



[*Sparrow*

Cloches are especially useful at this time of the year for producing earlier crops and for raising seedlings.

Potatoes

Because they are a staple article of diet, potatoes are one of the most generally planted of vegetable crops in New Zealand. They are grown in practically every home garden; even where space is at a premium it is usually profitable to grow at least one row of early potatoes.

Many home gardeners who have the space have tried growing a considerable area and have been discouraged by their comparative lack of success and as a result now plant potatoes in a perfunctory way. The potato crop is, however, so important that the selection of varieties and their planting and cultivation deserve a good deal of attention.

Though the home gardener can usually make his soil more fertile by such means as drainage, rotation of crops, the addition of humus or humus-forming materials, and the judicious application of fertilisers, he cannot change his soil type, and though he may be able to provide shelter, he cannot change the aspect of his garden. Thus if his garden soil is a heavy clay loam and has a southerly aspect, he may be able to mitigate its worst features, but can rarely do more. He should therefore select varieties most suited to his conditions. If he has space, he should try several of the most suitable for 2 or 3 years; a 1-year trial is rarely of much value, as conditions may be exceptional.

One of the most important points in growing potatoes is the use of Government-certified seed. The advantages of Certified seed and soil preparation and planting were described in last month's "Journal".

Sweet Corn or Sugar Maize

There is much confusion among home gardeners about the difference between sweet corn (*Zea mays*) and types of maize grown chiefly for stock food. The important difference lies in the make-up of the grain.

The tissue enclosed with the embryo in the seed coat of sweet corn contains a higher percentage of sugars and a correspondingly lower percentage of starch than other types of maize. When dry the grains of sweet corn become wrinkled, but the seed coat of the more starchy maize remains smooth and rounded.

Sweet corn is a member of the grass family, which is the greatest of all food-yielding plants. It is an annual and bears separate male (tassel) and female (ear) flowers. Pollination normally takes place as soon as the tassels appear, and development of the corn should be rapid thereafter. The edible stage is usually reached 2 to 4 weeks later, according to temperature, usually when the tassels have just withered.

Maturity Test

Maturity is commonly tested by thumbnail pressure. The young grains are first watery inside, then milky, then doughy, and finally the "dent" stage is reached, when the grains are too hard to be palatable. Cobs should be harvested with a gentle jerk or cut with a sharp knife when the milky contents of the grain are beginning to thicken but are still milky.

Manuring

Sweet corn can be grown on a wide variety of soils, and though crops can be grown on soil of only moderate fertility, best results are obtained on warm, well-manured, medium or light loams. Addition of organic material such as farmyard or stable manure is advisable on most home garden soils.

Extensive research on the manuring of corn indicates that on most soils both quality and yield of cobs are likely to be improved by a fertiliser containing nitrogen, phosphorus, and potash. A fertiliser likely to suit a wide range of conditions can be made up by mixing either 4 parts by weight of blood and bone and 1 part of sulphate or muriate of potash or 2½ parts each of sulphate of ammonia and superphosphate and 1 part of potash. Either mixture can be applied at 3oz. to 6oz. to a square yard, according to the fertility of the soil.

In hardiness sweet corn compares with the tomato and french bean and can be sown outside about the same time as french beans or New Zealand spinach.

Sweet corn can be grown in rows, but if it is grown in hills or clumps, pollination is usually assisted. Seed should be sown 1in. to 2in. deep. If seed is planted in rows, the plants should be 12in. apart and the rows 36in. apart. Clumps should be 36in. apart, and though it is usually advisable to sow about 7 or 8 seeds at each clump to allow for failures, only 4 or 5 of the strongest plants should be left after seedlings reach about 2in. high. The number of seeds per ounce varies from about 100 to 230 according to variety.

Removal of Suckers

Suckers often develop at the bases of plants, but there is no evidence that their removal promotes earliness or increases the number or weight of the ears on the stems. When the plants are 3ft. to 4ft. high it is usually advisable to earth them up the stems to a height of 6in. to 8in., as this benefits the roots and helps to support them against wind. In exposed positions staking may also be necessary. A warm, sunny, sheltered position is preferable in most gardens, and soils rich in organic matter should not require watering unless conditions are exceptionally dry. In most southern districts the crop is likely to be disappointing in cold, wet seasons.

The choice of a variety suited to local conditions is very important and much work has been done overseas on the production of varieties suited to specific conditions. Popular varieties in New Zealand are Country Gentleman, Golden Bantam, Golden Cross Bantam, and Stowell's Evergreen.

Tomatoes

Most varieties of tomatoes are damaged by more than a few degrees of frost and plants that have been raised under glass are usually particularly susceptible, as they are rarely as fully hardened off as they should be. Except in a few northern districts, tomatoes are usually set out in the field toward the end of October, though on level areas such as the Christchurch district which tend to be low lying and not directly on the coast, planting may have to be delayed until about the second week in November.

Soil preparation should begin early. A deeply dug, well-drained soil rich in humus and a warm, sheltered situation having the maximum amount of sunshine are best. Plants for setting out should be sturdy, erect, 6in. to 8in. high, and free from disease. The foliage should be an unblemished dark green and the bases of the stems a dark purple which as it extends upward gradually merges with the natural green of the plants.

Choice of Plants

It is advisable to obtain plants from a grower who uses sterilised soil, who takes other precautions against disease, and who does not crowd individual plants in the boxes so that they are thin and weak. Diseased plants will be an endless source of worry to the grower and are usually best destroyed. Similarly plants that have weak rooting systems or are thin and starved will suffer a severe check, particularly if the weather is unfavourable when the seedlings are planted out, and valuable time will be lost during their recovery.

Hardening off should be done at home if the plants bought are tender and the weather is uncertain. Plants should be hardened off by gradually increased exposure to conditions similar to those in which they will finally be planted out.

Unless dwarf varieties are to be grown, provision must be made for supporting the plants. They can be staked individually or tied to wires supported by end posts; occasionally they are grown on two stems or, rarely, left unpruned.

Acid or heavy soils should usually be limed, preferably in the previous autumn, at 3oz. to 4oz. a square yard, but on certain soils and particularly in high-rainfall areas lime can be applied at twice or three times this rate. It is preferable to apply moderate dressings at relatively short intervals than very heavy dressings at long intervals.

Manuring

Well-rotted organic material such as farmyard manure or compost is recommended for most garden soils, but it should be thoroughly mixed with the soil a considerable time before planting. Where additional fertiliser is necessary a balanced dressing of artificial manure as advised for sweet corn can be applied.

Dwarf plants should be set not less than 2ft. apart in the rows and other types 12in. to 15in. apart. The rows should be 36in. to 48in. apart.

Good varieties include Stoner's Dwarf Gem, Adelaide Dwarf, Marglobe, and Early Chatham (dwarf). Others are Kondine, Best of All, Carter's Sunrise, Potentate, Moneymaker, and Stoner's Prolific. Numerous other good varieties are listed in most seedsmen's catalogues.

Yams

The true yam is a tropical plant with an edible root and belongs to the genus *Dioscorea*. The common yam of New Zealand gardens (*Oxalis crenata*) belongs to the same family as the shamrock, the foliage of which is somewhat similar. It is grown for the tubers, which are long and ovoid and are marked with numerous regular hollows. They have a smooth skin which may be yellow, white, or red. The end which joins the stem is usually slightly narrowed. The plant, which has a spreading habit, grows well in warm situations in well-drained, rich soils that preferably are light. The yam is a perennial, but as it is frost tender, it is usually grown after the manner of potatoes. It is propagated by sets like the potato, but can be grown from cuttings, which are easily rooted.

The sets should be planted 3in. deep and 18in. apart in rows 2ft. apart as early as possible, but the time of planting should be arranged so that there will be no danger of frost damage to the foliage. In districts where the plant grows particularly well spacing should be more liberal.

As the stems lengthen they should be covered to within 6in. to 8in. of the tops with light soil or compost, as this assists the development of new tubers. The tubers, which are produced in great abundance, are rarely thicker than a hen's egg; they do not swell much until fairly late in the season, and in most districts it is not customary to gather them until frost has cut down the foliage. The tubers of some strains have a somewhat acid taste when first dug, but quickly lose this acidity on exposure to the sun.

Importance of Adequate Bee Combs

Seasonal Notes for the Domestic Beekeeper

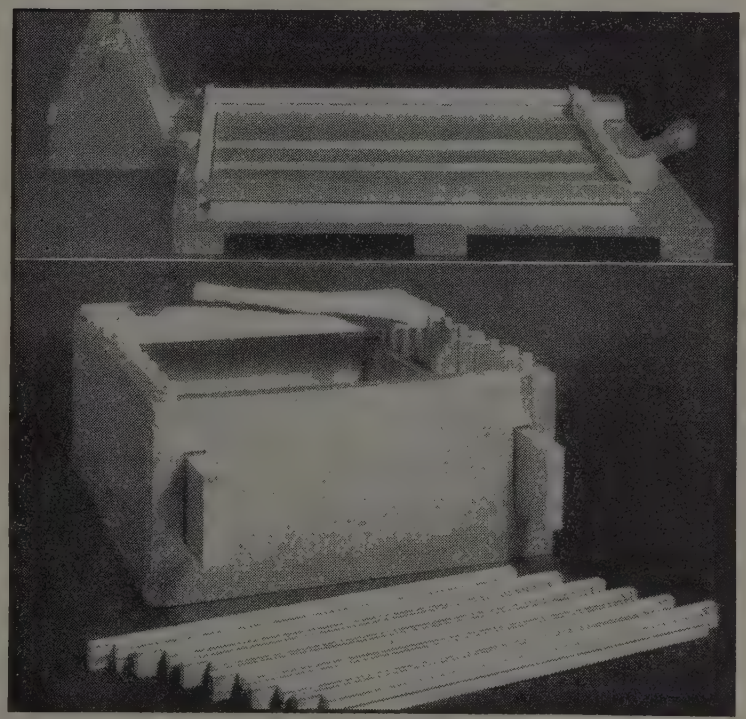
WITH the coming of spring the primary needs of a bee colony are increased population and the assurance of adequate stores of honey and pollen. Satisfactory population increase cannot be achieved unless the colony is provided with an ample amount of combs consisting of worker-size cells. In this article D. Roberts, Apiary Instructor, Department of Agriculture, Auckland, discusses the importance of good combs to successful beekeeping.

BEEKEEPERS making the first full spring inspection of their colonies will find this is an excellent time to sort out combs needing replacement. Combs that were full of honey and pollen when given to the bees in autumn will now be largely empty and the condition of the cells and comb generally can be seen at a glance. All combs that are misshapen, contain drone cells, or are improperly built out to the ends and bottom bars should be marked for replacement.

The importance to the well-being of the colony of good, properly constructed brood combs containing only worker cells, their economic value in terms of honey production, and their contribution to the ease of the beekeeper in carrying out hive manipulations cannot be over-estimated.

Bees when left to their own devices or when supplied with only roughly built frames which are not fitted with proper, correctly installed foundation will build a large proportion of drone cells in most of the combs they construct. Combs built in such circumstances will also tend to be uneven, will fail to hang vertically in the frames, and will often have marked bulges on the sides. Such combs are difficult to remove from the hive for inspection without crushing and killing many of the bees and possibly the queen. Badly built frames and combs lead to much waste of time in hive manipulation and cause colonies to become upset, with consequent unnecessary stinging and discomfort to the operator.

When bees are allowed to build comb without properly fitted foundation the comb will contain drone cells in large numbers. Drones, because of their bodily construction, are unable to gather honey and pollen and thus are consumers only, contributing nothing toward the maintenance of the colony's food supply. It is estimated by competent authorities that at least one cell of honey is required to feed either a drone or worker bee throughout the larval stage of its development. A worker bee will be a producer throughout its life, but a drone can be nothing else than a consumer. As well as the honey and pollen consumed during development, drones will use as much or more food during their lifetime. A standard Langstroth brood frame when filled will contain 5lb. or more of honey. Thus for every frame of drone brood raised by the bees at least 10lb. of honey will be consumed. In addition to this wastage of honey, the raising of excessive drone brood requires the attention of many worker bees which would otherwise be engaged in caring for worker brood.



[*Sparrow*

Upper—A frame-wiring jig in use. Lower—A frame-building jig in operation. The bottom bars have been nailed in place and the top bars are being nailed.

Though the bees will inevitably build a few drone cells in spite of all the beekeeper may do, the provision of accurately constructed frames fitted with proper foundation correctly installed and wired will reduce this wastage to a minimum.

If best results are to be secured from any colony, it is essential that the bees be provided with adequate space for rearing worker brood. There are approximately 132 sq. in. of comb surface to the standard Langstroth frame, and provided this comb surface is of wholly worker cell construction, it will contain about 6500 young bees when filled with larvae.

If the combs contain many drone cells or are imperfect in other ways, there is a big loss of capacity for worker brood. The retention of many imperfect brood combs can quickly reduce the capacity of a colony to rear brood, and consequently to gather a payable honey crop, by 50 per cent. or more.

In addition to the loss of crop imperfect brood combs, particularly those with large areas of drone cells, are one of the prime causes of swarming. A colony having good brood combs with a minimum of drone cells is far less likely to swarm in similar circumstances than one in which the brood combs are imperfect to any considerable extent.

From the aspects of better honey production, swarm control, ease of handling, both in the apiary and the extracting room, and general hive management good combs are of first importance to successful beekeeping and are well worth the care and attention necessary for their production.

BEE COMBS . . .

With comb foundation at the highest price for many years beekeepers may feel tempted to retain for further use combs which should be culled immediately. However, the wax from old combs can be salvaged, and the yield from this source is generally more than sufficient to replace the culled combs with new foundation. The yield of wax from old combs will vary considerably with the nature of the combs and the methods used for rendering it down, but it should average not less than between 1½lb. and 2lb. of wax from every ten combs. If the wax recovered is forwarded to a manufacturer for conversion into foundation, it will usually produce sufficient to make the necessary replacements at a cost approximately 25 per cent. of that required if the foundation is purchased from a retail source.

By carefully salvaging and rendering down all old combs, burr comb, and wax scrapings beekeepers can be assured of a sufficient supply of foundation wax to meet all needs other than for expansion.

The production of good combs containing only worker cells requires careful frame assembly and intelligent hive management. The building up of the wooden frames should be most carefully carried out. They should always be assembled so that the top bar ends and bottom bar are perfectly square with one another.

Good firm nailing is most important so that the frames will not become strained or out of square when being removed from the hive for inspection or when honey is being removed in the extractor. Insufficient or poor nailing will allow the top bars of frames to lift and break away when being loosened in the hive with the hive tool. Apart from the disturbance to the bees involved the lifting of the top bar will break the comb and, though this will be repaired by the bees, the parts repaired will most likely be built as drone comb.

At least two flat-headed 1¼in. coated frame nails should be used at each end of the top bar. These should be driven at an angle to the vertical if maximum resistance to separation of the top bar is to be obtained. One similar nail in each end is usually sufficient to fasten the bottom bar.

Frame-building Jig

When only a few frames are to be made up they can be assembled satisfactorily one at a time, but when a considerable number are required a frame-building jig will greatly speed up the work and will tend to ensure that the frames are accurately assembled. A simple frame-building jig can be easily made from an empty hive super. The super is cut down to give inside measurements of 17⅞in. length, 14¼in. width, and a depth of 8¼in. Two slots 4in. by 1in. are then cut in each side of the jig. They are placed centrally with their outer edges 7/16in. from the inner edge of the box. Two pieces of 4in. by 1in. timber 18in. long are then dressed until they will slide smoothly through the slots.

When the jig is to be used the pieces of 4in. timber are placed in the slots and the end bars dropped in place between the pieces of 4in. by 1in. and the end of the box. The top or bottom bars are then placed in position and nailed. With Hoffman frames the narrow or bottom part of the end bar must be placed upward so that the bottom bar can be nailed in place first. This is essential with Hoffman frames because if the top bars are nailed first, the rather delicate lugs of the slot taking the bottom bar will tend to break. When the frames are nailed together the two pieces of wood are removed from the slots and the frames can then be lifted out. A jig made to the sizes given will take ten Hoffman frames at a time.

Because wax foundation will soften and quickly go out of shape in the hive temperatures maintained by the bees, the foundation must be supported in the frame in some way. The most satisfactory method is the use of three or four strands of wire stretched horizontally between the end bars. When received from the manufacturers the end bars of standard brood frames have either three or four holes bored in them to take the wire. A special tin-coated wire made for the purpose is available from suppliers of hive equipment and this should be used when possible. Galvanised, plain steel, or copper wire is not suitable and may react with the acids contained in the honey. The wiring of the frames should have sufficient tension so that when plucked with the fingers it gives off a high-pitched twang. It is difficult to obtain the correct tension without the assistance of some form of frame-wiring device. This can be purchased or can be made by the beekeeper (see the upper illustration on page 239). To wire the frame drive two strong tacks a short distance into the sides of the end bars, one near the top hole and the other close to the bottom hole at the opposite end of the frame in frames with three holes. In frames with four holes the second tack must be placed close to the bottom hole of the same bar as the first tack.

The frame is then placed in the frame-wiring device and wire is threaded through the holes, starting from the top. The free end of the wire is twisted round the bottom tack, which is then driven home. Pressure is then applied to the end bars by the wiring device and the wire drawn fairly taut and fastened to the top tack. When the tacks are driven home the pressure is released and the end bars spring back into place, making the wire taut. The wire is cut at the delivery end and then broken off at the tack heads with a sharp twist. No projecting pieces of wire should be left at the tacks, as these can cause painful injuries when frames are handled. Next, a sheet of foundation is placed on the frame and its upper edge is drawn by the fingers into the groove in the top bar. A teaspoon of melted wax is then run down the length of the top bar alongside the foundation. This will hold the foundation securely in the groove. The wax used should not be hotter than is necessary to make it flow freely. If it is too hot, in addition to slowing up the work it will damage the foundation so that the bees may draw it out as drone comb.

Embedding the Wires

Though the foundation is now attached to the frame, it should not be given to the bees until it is further strengthened by the wires being embedded in the wax. This is most important, and unless it is properly carried out, the resulting combs will not be satisfactory and will break down when handled. Embedding can be done by hand with the use of a tool known as a spur wire embedder, but an electric embedder, using the principle of heat, makes a much more satisfactory job and is much quicker. To embed the wire electrically the frame is placed with the wires uppermost on a piece of board ⅜in. thick which is cut to fit loosely inside the frame, and the contacts of the electric embedder are placed on each of the tacks holding the wire. The wire quickly heats and sinks into the wax. When the contacts are removed the melted wax around the wires congeals and the wire is perfectly secured. A little practice will soon enable the operator to gauge the amount of heat necessary to make a perfect job without cutting entirely through the foundation.

Electric embedders can be purchased from suppliers of apiary equipment or can be made up to order. Because of the risk of injury from faulty material inherent in all electrical appliances used by hand only first-class equipment should be used in embedders, and if the tool is to be made to order, the work can be done only by a qualified electrician.

The methods described above will enable frames of foundation to be prepared to a high standard, but care in placing the frames in the hive is still very necessary if first-class brood combs are to be obtained. It will be found that combs placed in the super above the brood nest will usually be much better drawn out and fastened down to the bottom bar than those placed in the bottom box. Frames of foundation designed for use as brood combs should not be placed against the side of the super but should always be placed toward the middle for best results. Combs will not be built satisfactorily unless there is a honey flow in progress or the bees are fed heavily with sugar or honey syrup.

The Menace of Nassella Tussock

BECAUSE of its aggressive nature, its unpalatability, and its capacity to spread, nassella tussock is one of the worst weeds introduced to New Zealand. The measures which have been adopted to deal with it are described in this article by J. W. Woodcock, Assistant Director, Extension Division, Department of Agriculture, Wellington.

SETTLERS in North Canterbury became concerned in 1940 about the spread of a strange tussock in the Waipara district. Though its presence had been known for at least 25 years, this species in the early period of its naturalisation received little attention, being regarded as "just another tussock". It was indeed similar in some respects to various native tussocks, especially hard tussock, and its early spread was not looked on with alarm. But gradually its many undesirable features became apparent: Stock would not eat it; its drooping habit shaded out other herbs and grasses; it produced seed prolifically and the seed was carried far by the prevailing winds; the seed appeared to germinate under conditions unfavourable to that of most other species; burning did not destroy it, but rather encouraged its spread. After having gained a foothold and consolidated itself this invader from the Argentine, invulnerable to ordinary methods of weed control, moved to other districts.

In 1934 H. H. Allan, then Systematic Botanist of the Plant Research Bureau of the Department of Scientific and Industrial Research, had identified plants of this weed taken from the Waipara district, Canterbury as *Nassella trichotoma*; a native of South America and a species widespread in the Argentine, where it occurs on the pampas, chiefly on cultivated ground and in waste places. It became commonly known as nassella tussock.

Allan (1) later directed attention to the serious menace which the weed would become if not controlled, drew up a scheme for a comprehensive survey, and outlined measures for further study.

The survey was carried out later by P. R. Barrer, of the Department of Agriculture, and A. J. Healy, of the Department of Scientific and Industrial Research. It was discovered that nassella tussock was very widely established in North Canterbury and was also present in the Fairhall district of Marlborough. Healy continued to study the weed over some years and published a comprehensive report of his observations (2).

Nassella Tussock Boards

The objectionable nature of nassella tussock and its alarming spread prompted local farming organisations in North Canterbury to set up a special committee which carried out much valuable work in making farmers aware of the position by arranging field days.

In 1943 special legislation was passed vesting powers for control of nassella tussock in those county councils where the weed was established and this was followed by the setting up in North Canterbury of a Combined Counties Nassella Tussock Committee. This committee appointed an inspector and operated a scheme for the control of the weed within the counties of Waipara, Kowai, Cheviot, and Amuri. The Marlborough County also carried out control measures under this legislation.

The Nassella Tussock Act, passed in 1946, provided for the setting up of two boards, one in North Canterbury to replace the committee and the other in Marlborough to carry out control measures in the counties of Marlborough, Awatere, and Kaikoura. In addition provision was made for any county council to "promote and carry out measures for the detection, control, and eradication of nassella tussock".

Subsequently the two boards have continued operations under subsidy from the Government and have tried to get all farmers with infested areas to grub out plants as they appeared or to plant trees on areas where nassella tussock had got beyond the grubbing stage. Where settlers were unable to carry out these measures the boards have tried to assist them and have operated grubbing gangs to deal with those thicker infestations which farmers could not eradicate. Grubbing tussock is an exceedingly hard and tedious job and the boards have always been faced with the task of getting labour for these grubbing gangs.

The planting of trees on the thicker areas has not progressed to the extent visualised when the Act was passed. Here again shortage of labour and the necessary fencing materials and a series of dry winters that militated against successful tree establishment have presented difficulties in controlling the weed by afforestation.

The inspectors and rangers employed by the boards, however, have been vigilant in surveying the area and drawing farmers' attention to the presence of nassella tussock, and the grubbing of isolated plants by the rangers at the time of inspection has undoubtedly kept a check on the rapid spread of the weed on relatively clean farms. Where larger patches of the weed are discovered farmers are required to grub them out within a certain time and generally the cooperation between farmers and the boards in this has been good.

However, there remain several centres of thick nassella tussock infestation on unploughable country which are a serious problem to the boards and to the surrounding farmers. These have been allowed to develop to a stage where the very magnitude of the task discourages any attempt at hand grubbing and tree planting is too hazardous because of the poor nature of the soil and the dryness of the district. As successive crops of seed from such areas blown by the prevailing winds (chiefly "nor'-westers") for considerable distances are a constant menace to other farms, the presence of such "problem" patches of nassella tussock is a constant reminder of the dangers of allowing the weed to build up a pure association of any magnitude.

A recent amendment to the original Nassella Tussock Act provides for the Government to supply finance to the boards toward special treatment of these "problem" areas in addition to the normal subsidies which are granted for general operations. The use of a chemical weedkiller (T.C.A.) which can be applied by aerial distribution has shown sufficient promise in small-scale experiments (3) to warrant its extended use on some of these "problem" areas, and it is chiefly in this method that hope of arresting the spread of nassella tussock is placed.

Distribution of Weed

The survey carried out by Healy and Barrer in 1941 estimated that approximately 110,000 acres were infested with the tussock to some degree. No reliable figures are available for the area infested at present, but it is estimated that in Amuri County a patch of 20 acres of dense tussock in 1941 has increased to about 300 acres today. In spite of widespread publicity and attempts at control it is considered that the total area involved has increased significantly since the 1941 survey.

In North Canterbury the area immediately threatened by nassella tussock infestation is roughly bounded on the north by the Conway River, on the south by the Kowai River South Branch, and to the west by a line running from Waiau through Waikari to the Kowai River South Branch near Balcairn. Because of the spread of the seed by wind the important points in any effort at control are those "problem" areas of dense tussock further inland near Waiau and the hills on the south bank of the Hurunui River near Balmoral Forest.

The major area of nassella tussock in Marlborough is on the Wither Hills near Fairhall, and the main "problem" area, a hill known as the "Wrekin", has been acquired by the Marlborough Nassella Tussock Board for special treatment.

Several instances of isolated tussocks being found on farms outside the North Canterbury threatened area have been reported at Rangiora, Kaiapoi, Waimakariri River, Rakaia Gorge and

THE MENACE OF NASSELLA TUSSOCK . . .

Lower Rakaia, and near the mouth of the Ashburton River. These may have been due to stock carrying the seed, though even the possibilities of seed being carried by clothing or on the outsides of cars cannot be overruled. Grass and clover seed produced in the main area is subject to the Nassella Tussock (Grass Seed) Regulations, which are designed to ensure that as far as possible such seed is not sent out of the area if it contains nassella tussock as an impurity.

Nassella tussock is a "tumble weed", falling into the category of plants in which the fruit-bearing portions are dispersed by wind. During December and January in infested localities inflorescences are commonly seen in the air on windy days and on any obstructions such as fencelines and shelter belts there can be seen masses of straw and seed caught on the windward side. On some days this windward spread of seed has been described as resembling a snowstorm. During the dispersal period large quantities of seed are deposited over arable land, pasture, and riverbed areas near established blocks of the tussock. Healy considered that nassella tussock was capable of extending its distribution at the rate of 6 miles in one season.

On the sunny faces of hill country likely to dry out in summer nassella tussock establishes easily and rapidly becomes dominant. The bare spaces formerly occupied by annual species after dry weather or even under normal conditions if overgrazing has been carried out are readily occupied by young nassella seedlings if the area has been subject to windborne infestations of seed. Because these seedlings are unpalatable, they have every opportunity to grow in relation to young plants of other species. Arable land and sown pastures can also become invaded by nassella and in serious cases this necessitates frequent and costly cultivation and regrassing. A heavy infestation is therefore a menace to dry, sunny slopes and cultivated ground several miles away, especially in the path of the prevailing winds.

Characteristics of Nassella Tussock

Nassella tussock is capable of establishing under hard conditions and growing in extremely dense communities to the exclusion of most other species, because as the tussocks mature they develop a dense, drooping habit which kills or prevents the establishment of other plants. The ability to spread widely is one of the dangerous characteristics of nassella tussock, but its lack of any marked distinguishing features in tussock country, once it has become established, militates against its detection and early elimination.

If nassella tussock had the bright yellow flower of the ragwort or the characteristic foliage of the thistle, it could easily be recognised from a distance, but in thousands of acres of country in the South Island nassella tussock could remain inconspicuous for some years until someone capable of identifying it saw it at close quarters or until it had increased to such an extent that it had assumed the typical appearance and undesirable features of nassella tussock domination.

On cultivated land or sown pastures the weed can be identified more readily by the fact that stock will not readily graze it, and its drooping habit soon shades out the surrounding palatable species.

Unless it is observed closely, the weed resembles other tussocks and it is therefore important that farmers should be able to identify it so that immediate eradication measures can be taken if it is discovered in unexpected localities. To distinguish it from hard tussock, silver tussock, and needle grass the key published by Allan and reproduced here could be used. Its pale green in contrast to the straw colour or brownish green appearance of other tussocks is a convenient way to distinguish nassella tussock from a distance. When it grows in masses its characteristic colour becomes all the more evident, though when seeding the plant takes on a purplish hue which is also very typical.

The illustrations on the opposite page show the coloration and the growth habits of the four species mentioned above and indicate the similarity between nassella and hard tussocks. Because nassella tussock has not been easily recognised up to the present getting rid of it in its early stages has been difficult. This species may even now be establishing itself on more remote hills south of the Waimakariri River, and, if any farmer on tussock country suspects that this species is present on his property, he should

How to Distinguish Nassella Tussock

	Nassella (*N. trichotoma*)	Hard Tussock (*Festuca novae-zelandiae*)	Silver Tussock (*Poa caespitosa*)	Needle Grass (*Stipa variabilis*)
Appearance of adult	Dense tussock with pale, drooping foliage and purplish flowering parts; drooping outward; leaf bases pale, somewhat swollen	Dense tussock with straw-coloured foliage; not drooping; pale, erect flowering parts	Dense tussock with yellowish to brownish green, slightly drooping foliage and straw-coloured, erect but spreading flowering parts	Small tufted plant, with short leaves of greyish green appearance and tall, erect flowering parts
Leaves	About 20in. long; very narrow; rough to downward touch	About 14in. long; very narrow, but less so than nassella; rough to downward touch	About 20in. long; narrow, but less so than the two former; somewhat flattish; smooth to downward touch	About 5in. long; narrow; rough to downward touch
Collar	With papery, rather long ligule; somewhat eared	Short, finely cut at tips; distinctly eared	Reduced to narrow rim; not eared	Distinct with long fine hairs; distinctly eared
Inflorescence	Ample, spreading, drooping; the whole easily detached	Ample, somewhat spreading, hardly drooping; not easily detached	Less ample, more erect; not easily detached	Ample for size of plant, erect; not easily detached
Stalk	About 15in. long; smooth	About 12in. long; rough	About 15in. long; smooth	About 6in. long; smooth
Flowering part	About 10in. long; spreading and drooping	About 6in. long; narrow and erect	About 6in. long; somewhat spreading; sub-erect	About 6in. long; erect; not spreading
Spikelets	Single flowered, purplish	Several flowered, pale green to straw coloured	Several flowered, pale green to straw coloured	Single flowered, greyish to slightly purplish
Seeds—Base	Somewhat pointed; hairy	Blunt; free from hairs	Blunt, with cobwebby hairs	Sharply pointed; hairless
Body	Short, broad, plump, ribbed; rather rough	Rather long; smooth, rounded on back	Rather long; roughish; keeled on back	Long, narrow, hairy, terete
Bristle	Flexuous; about 1in. long; twisted below	Very short; straight	Without a bristle	About 2in. long; strongly twisted below; bent at almost a right angle

IDENTIFICATION OF TUSSOCKS

NASSELLA TUSSOCK

SILVER TUSSOCK

draw the attention of the local officer of the Department of Agriculture to it for specific identification. If it proves to be nassella tussock, every effort should be made to eradicate it in its early stages before it secures a hold.

The experience gained in trying to eradicate nassella tussock in North Canterbury and Marlborough has convinced most people concerned with it that it is a most dangerous weed. It should not be allowed to spread further and the sooner it is brought under control the better.

Already the Government has spent large sums annually on subsidies in an endeavour to halt its spread and the Nassella Tussock Boards have endeavoured to get all farmers affected with nassella tussock infestation to eradicate it. The future of large areas of valuable second-class grazing country of the South Island, and possibly parts of the North Island, will be jeopardised unless this weed is confined to its present area of infestation and ultimately eliminated.

It may be many years before this is accomplished, but the discovery of new chemical weedkillers with the property of killing the nassella tussock and leaving useful species unharmed has given new hope to those who have striven toward the eradication of this sinister weed.

NEEDLE GRASS

HARD TUSSOCK

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1. H. H. Allan, "The New Zealand Journal of Agriculture", vol. 63, p. 91, 1941.
2. A. J. Healy, "Nassella Tussock", Bulletin 91, Department of Scientific and Industrial Research, 1945.
3. R. A. Milne, "Nassella Tussock Control", Proceedings of the Seventh New Zealand Weed Control Conference.

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Fodder Beet for Pig Feeding

A BRIEF review of reports on the use of fodder beet for pig feeding overseas and of the limited use of the roots in New Zealand to that date was published in the March 1953 issue of the "Journal". Little was known at that stage of the possibilities of the new varieties and it was decided to carry out trials with a number of the more promising ones. In this article A. Longwill, Superintendent, Pig Industry, Department of Agriculture, Wellington, discusses the results of two feeding trials and the place the crop can take in the economy of pig production. An article on page 272 discusses the agronomic qualities of a number of varieties grown at various centres throughout New Zealand during the 1953-54 season.

FOR some 25 years work has been going on in Denmark on the production of higher-yielding types of root crops for fodder. Some selections of sugar beet have been developed for stock feed, but mainly the work has been aimed at hybridising selected sugar beet and mangold strains. A few of the resulting varieties have become available to the farmer in New Zealand and trials were laid down by the Extension Division of the Department of Agriculture in 1953 to study the characteristics of some of the more promising varieties under New Zealand conditions. The report on these trials is published on page 272.

Cultivation

The local Fields Instructor should be consulted about practices appropriate to the district, but the following general guide may help.

As beet are gross feeders, the fertility status of the land to be cropped should be high. Cultivation should be deep and thorough, it should be started well in advance of the seeding date, and after the initial cultivation the land should be left to weather and settle to a reasonably fine and firm seed-bed.

For best results a long growing season is required and therefore the seed should be sown as early as possible, preferably in September. On early soils in the North Island August sowing could be tried in favourable circumstances, particularly if it is intended to begin using the crop in March or even earlier.

Treatment of the seed with one of the mercuric dusts against seed-borne disease is recommended. There is some recent evidence that an acid treatment of the seed is capable of assisting germination percentage. Details of these treatments can be supplied by the Department.

Seed should be sown at a uniform 1in. depth and in 21in. rows by planter or grain drill. At least 5cwt. to 8cwt. per acre of a mixed fertiliser composed of 3 parts of superphosphate, 2 parts of blood and bone, and 1 part of sulphate of potash should be applied before or at sowing. After plants have been thinned to 12in. to 15in. spacings a further hand dressing of 3cwt. of sulphate of ammonia should be applied. It is better to grow a small area well than a large area poorly.

Varieties for Pig Feeding

All the varieties of sugar beet and fodder beet are suitable for pig feeding and those of higher dry matter content particularly are much superior for this purpose to mangolds. The pig's relatively small, simple stomach does not deal very efficiently with large quantities of bulky food and therefore the varieties with a dry matter content approaching 20 per cent. are most suitable as pig food. Palatability trials were made in connection with the feeding trials dealt with later in this article, but results were not sufficiently conclusive to warrant publication at this stage. However, pigs cleaned up all varieties of fodder beet before eating much of the mangolds.

HEADING PHOTOGRAPH: A well-cultivated crop of sugar beet for fodder will outyield any other crop and is well suited to pig feeding. The crop shown yielded 60 tons per acre.

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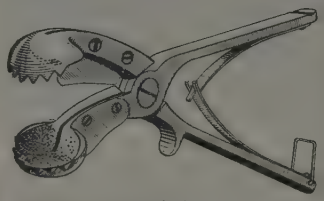

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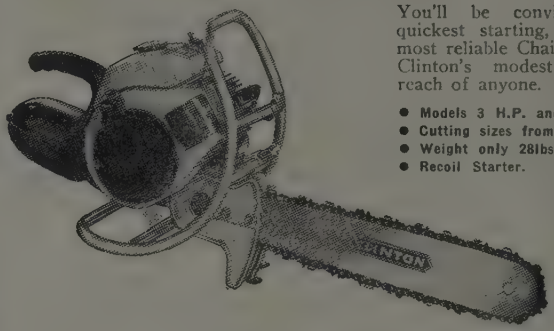

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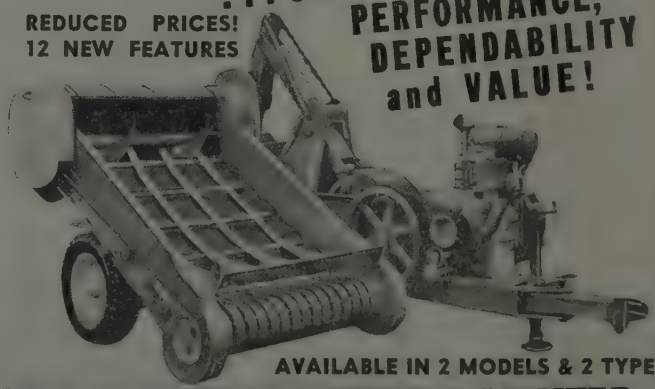

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Apart from nutrient quality and palatability important elements in the choice of variety are the ease of harvesting and the amount of earth adhering to roots when lifted. A guide to this will be obtained from the table on page 274. Considerable variation in the character of plants of the same variety may occur under differing soil and water-table conditions.

All varieties tried to date are capable of high yields of dry matter per acre and the roots are suitable for feeding to pigs of all ages. Small pigs should be introduced to the roots gradually and should also be receiving at least 2 food units of high-quality feed. One gallon of skimmed milk or 1lb. of meal = 1 f.u. (food unit). Once the pigs have settled down to the diet the roots may be fed ad lib., with the basic ration of concentrate-quality foods maintained at 2 to 2½ f.u. Sows will consume up to 30lb. per day, which is equivalent to 5 to 6 f.u.

Varieties for General Use

The varieties with dry matter contents of approximately 20 per cent. are specially suited for pig feeding. If these varieties are fed to cattle, they must be rationed carefully to avoid causing digestive upsets. The varieties with 15 to 17 per cent. of dry matter are safe for general purposes and are widely used today in the Scandinavian countries and Europe generally for cattle feeding. Varieties in this range tried in New Zealand include Korsroe, Red Otofte, and Yellow Daeno. Results to date with these varieties indicate that they are worth further trial.

Much more experience in farm trials in New Zealand will be necessary to demonstrate whether any one variety is generally more suitable than others. Pajbjerg Rex, which has been grown by more New Zealand farmers than any other variety, has proved eminently suitable. It combines reasonably high dry matter with reasonable ease of harvesting.

Some farmers may place more weight on one characteristic than another, depending on soil type, method of harvesting, or other considerations. The other varieties mentioned or others as yet untried in New Zealand may be found to meet the requirements of the individual. For this reason the table on page 274 deserves careful study. After a further year's trials some yield data may be available for publication.

Feeding Fodder Beet to Pigs

In contrast to mangolds, which must be clamped, involving double handling, all the varieties of fodder beet tried have been fed safely direct from the paddock. The crop may be grazed in situ by the pigs if it is on free-draining soil. Break feeding with the electric fence has been practised successfully

FODDER BEET FOR PIG FEEDING

[*My Bonnie*

In the best species there is a tendency for a wide variety of types of plants to occur; from the heavy-topped, silver-beet-like plant at right through a range to the large fodder-root type at left, which has a top much more like that of a mangold. This variation emphasises the necessity of getting seed from a reliable source.

at the Ruakura Animal Research Station this year, with fences across the rows of fodder beet and maize sown in parallel strips the length of the paddock.

If the cropped area is to be ploughed again before the crop is finished, the roots will keep well if they are lifted clean and stored in a dry, well-ventilated clamp. The usual practice on North Island farms is to pull the roots and feed them direct to the pigs. English workers have noted that the tops are inclined to have a laxative effect, but provided the amount fed is increased with discretion, there are usually no complications. If scouring does occur, pulling the roots 24 hours before they are fed to allow the tops to wilt slightly is recommended.

The only other precaution which has been found desirable is that roots being fed to small pigs should be quartered with a spade to enable the pigs to eat them more easily. Quartering can be discontinued when the pigs are able to deal with the whole root without difficulty.

Main Uses of the Crop

Apart from the use of the crop as a cheap bulk feed for the wintering of breeding stock and store pigs, fodder beet may be used over an extended period (almost 6 months) for the following purposes:—

1. For finishing pigs to the most profitable weight (either pork or bacon as appropriate) in April and May with limited amounts of milk and meal. Results of the use of the crop in this way are given later.

2. For effecting automatic restriction of intake in finishing baconers to ensure good grading of the carcasses. This applies chiefly to the production in spring of baconers from overwintered stores. The objective in carcass quality can be attained with average pigs by adjusting the quantity of milk and roots so that a steady gain of about 1¼lb. liveweight per day is maintained.

Meal Replacement Value

The value of fodder beet for replacing meals and other foods has been determined by Danish workers as about 6lb. of fodder beet (20 per cent. dry matter) for 1lb. of barley meal. This value can apparently vary considerably according to conditions of feeding, the ration fed, the variety, and where the crops are grown.

Trials carried out at Wye, England, with the variety Hunsballe gave 4.7lb. of beet as being equivalent to 1lb. of meal when the beet was fed with 3lb. per pig daily of a mixed meal containing 20 per cent. of fish meal. In Tasmania a replacement value of 4lb. of fodder beet to 1lb. of crushed wheat was obtained in one isolated trial.

No properly designed trials to determine replacement values have been carried out to date in New Zealand, but two trials where quantities fed

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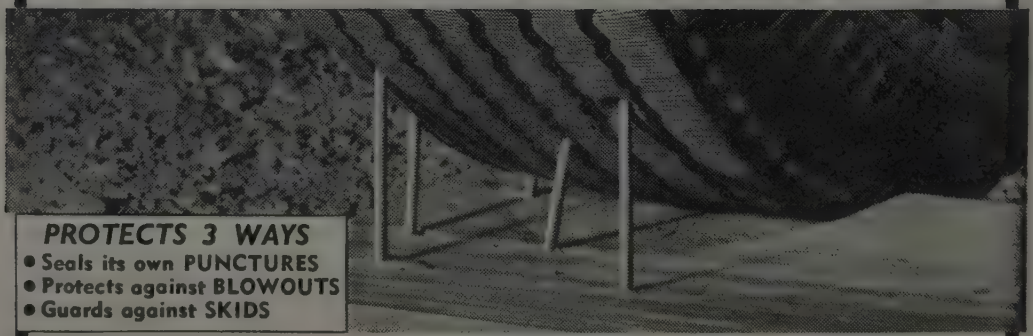

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have been weighed carefully suggest a high replacement value under practical farm conditions. Details of these trials are given in the next section.

Results of Feeding Trials

In the past two seasons trials have been carried out at the Department of Agriculture's Flock House Farm of Instruction, Bulls, as follows:—

Trial 1 (March-April 1954): Demonstration of the Use of Fodder Beet to Bring Late Summer Litters to Porker Weights before the End of the Dairy Season

Two balanced groups of 8 and 9 pigs were used. One group received a basic ration of 1 gallon of skimmed milk and 1lb. of meal (1 part of meat meal to 2 parts of barley meal) and the other group 1 gallon of skimmed milk and 2lb. of the same meal. Mixed varieties of fodder beet from a variety trial were offered ad lib. on grass runs to all pigs.

Beet feeding was begun when the pigs were about 60lb. liveweight (on 5 March 1954). During the first fortnight the pigs were becoming accustomed to the beet and consumed only an average of a little over 5lb. daily. This, however, does not reveal the actual picture, which was one of rapidly increasing daily consumption from nothing to nearly 20lb. per pig daily.

On each weighing day pigs were weighed at the same time—before the day's ration of fodder beet was fed out—and gains as shown in Table 1 were made.

It is clear that from 60lb. liveweight these pigs were capable of making efficient use of fodder beet.

Trial 2 (March-May 1955): Demonstration of Value of Fodder Beet in Enabling Pigs to be Taken on to Baconer Weights when the Market Favours These

Two groups of pigs weighing an average of 112lb. liveweight were introduced to fodder beet at the end of March. One group received a basic ration of 1½ gallons of skimmed milk and ½lb. of meal and the other group 2½ gallons of skimmed milk and ½lb. of meal. Both received all the beet they would readily clean up on grass runs. Again the intake of beet increased rapidly over the first fortnight to reach almost 20lb. per pig daily at 120lb. liveweight. The pigs had received a check before the trial started and the initial gains were rather poor. However, gains improved to the desired level toward the end of the trial, which lasted 7 weeks.

These trials are particularly interesting as:—

(a) They represent the first reported use of fodder beet as a substantial part of the fattening ration of pigs in New Zealand.

Three-week-old pigs while on the sow start to nibble at beet roots. These pigs will be consuming quite substantial quantities of roots by weaning time.

TABLE 1—SUMMARY OF RESULTS IN TRIAL 1

Date (1954)		5/3	19/3	2/4	15/4	30/4	Total gain in 56 days lb.	Percentage of fodder beet in total digestible nutrients
Group 1								
Av. liveweight (lb.)		59.75	73.4	91.1	109.75	129.25		
Av. daily gain per pig (lb.)		—	0.97	1.27	1.43	1.30		
Feed given (av. per day over period)	S. milk (gals.)	—	1	1	1	1	69.5	74
	Meal (lb.)	—	1	1	1	1		
	F. beet (lb.)	—	5.6	24.5	22.5	24.0		
Group 2								
Av. liveweight (lb.)		58.55	70.9	88.0	105.3	130.4		
Av. daily gain per pig (lb.)		—	0.88	1.22	1.33	1.67		
Feed given (av. per day over period)	S. milk (gals.)	—	1	1	1	1	71.9	66
	Meal (lb.)	—	2	2	2	2		
	F. beet (lb.)	—	5.1	22.8	22.8	24.0		

TABLE 2—SUMMARY OF RESULTS IN TRIAL 2

Date (1955)		29/3	12/4	3/5	17/5	Total gain in 49 days lb.	Percentage of fodder beet in total digestible nutrients
Group 1							
Av. liveweight (lb.)		111.7	120.8	140.3	158.0		
Av. daily gain per pig (lb.)		—	0.65	0.92	1.26		
Feed given (av. per day over period)	S. milk (gals.)	—	1.5	1.5	1.5	46.3	73
	Meal (lb.)	—	0.5	0.5	0.5		
	F. beet (lb.)	—	7.2	24	25		
Group 2							
Av. liveweight (lb.)		112.6	124.7	141.3	161.0		
Av. daily gain per pig (lb.)		—	0.86	0.79	1.40		
Feed given (av. per day over period)	S. milk (gals.)	—	2.5	2.5	2.5	48.4	64
	Meal (lb.)	—	0.5	0.5	0.5		
	F. beet (lb.)	—	7.1	19	23		

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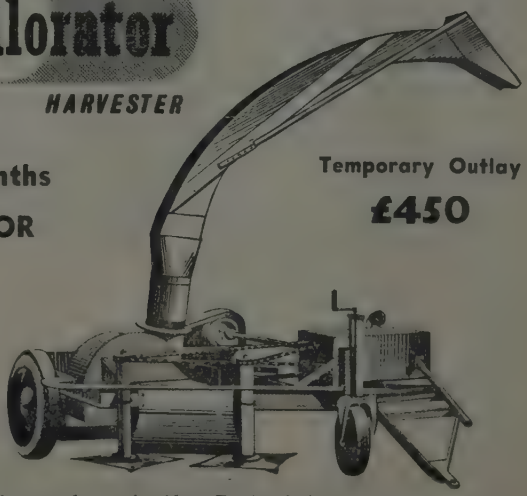

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(b) The intake of fodder beet was recorded sufficiently accurately for practical farm purposes. Refusals were not measured, but the feeding methods used reduced these to the practical minimum.

(c) The proportion of the total ration represented by fodder beet is much higher than any reported in overseas literature.

The trials show that a satisfactory growth-rate can be obtained in pigs fattening for either pork or bacon production with as much as two-thirds of the nutrients consumed being from fodder beet of varieties having a dry-matter content of 20 per cent. or higher. The conditions under which the pigs were run were typical of a great number of farms in New Zealand. A wooden house 8ft. x 8ft., unlined and with open front, provided sleeping accommodation and gave free access to 1/5-acre run in fair grass.

Economic Value of Fodder Beet

Previous reports have indicated the high value of fodder beet as part of a wintering ration, supplemented with meal, for stores and breeding stock. However, the full value of the crop will probably not be appreciated until it is used regularly in the manner demonstrated by these trials.

The gross farm returns obtainable per acre of a 30-ton crop of fodder beet, calculated from the trials and allowing for the cost of meal used, is shown in Table 3. The return when the milk used is costed at 3d. per gallon is also shown.

TABLE 3—VALUE OF INCREASED WEIGHT DURING TRIALS, FOOD USED, AND CALCULATED RETURNS PER ACRE FOR BEET

	Value of increase per pig £ s. d.	No. of days on trial	Total food per pig S. milk gals.	Meal lb.	Beet lb.	Return per acre for beet Gross farm £	Milk (costed) £
Trial 1							
Group 1 ..	3 8 0	56	56	56	1,100	175	132
Group 2 ..	3 8 0	56	56	104	947	167	115
Trial 2							
Group 1 ..	2 0 0	49	74	24.5	792	170	91
Group 2 ..	2 3 0	49	122	24.5	680	212	62

Table 3 shows clearly that if no value is placed on skimmed milk, a very high return per acre is obtainable from a crop of fodder beet used in the way suggested by the trials. Levels of beet intake are somewhat restricted when skimmed milk is available to the extent of 2½ gallons per day, but fattening pigs do not appear to increase beet intake rapidly after the 20lb. per day level is reached (Trial 2, Group 1). This level was reached in Trial 1 at less than 90lb. liveweight. It seems likely that some pigs at this stage were not eating the beet, involving a certain amount of waste, which is almost inseparable from feeding out on grass runs in autumn. However, all the beet supplied, whether eaten or not, has been included in the above calculations. If better utilisation can be achieved, returns will be better than those shown.

An interesting point about the finishing of porkers on the declining milk supply in autumn (Trial 1) is that as long as 1 gallon of milk per day is available, no advantage is gained by feeding more than 1lb. of meal per pig daily when fodder beet to appetite is available. Adequate growth and better profits are obtainable—on the present relationship between meal prices and pig meat prices—from the use of 1lb. of meal rather than double this amount as a supplement to 1 gallon of skimmed milk with fodder beet.

This indicates that fodder beet can supply a much higher useful proportion of the ration and can replace meal to a greater extent than has so far been claimed for the crop overseas, where the meal-meat price relationship is generally more favourable to the pig producer than in New Zealand. If farmers are prepared to grow fodder beet properly, the crop can help greatly in improving the efficiency of utilisation of surplus dairy by-products through the pig and, as the quantity of by-products available for pigs declines, in providing another cheap food on which to base a sound industry.

Restricted Feeding of Baconers

Though Trial 2 was carried out in autumn, it was designed to give some information on the effect of level of high-quality basic ration. The higher level of meal feeding only slightly slowed up the rate of increase of intake of fodder beet and before long both groups were consuming practically identical amounts of beet. The reason why Group 2 in this trial did not make better gains in the early stages of the trial is not clear, but is probably connected with the bulkiness of this ration.

From the rate of gain attained in the final fortnight, however, it is clear that this basic ration may well be too liberal if effective restriction of the ration to improve carcass quality is to be achieved in spring. If meal is omitted from the ration, the bulkiness of the skimmed milk and fodder beet ration may effect the desired degree of restriction. This point will be further investigated at the first opportunity.

Carcass quality of the pigs was not reported on. It is known from overseas reports of the use of fodder beet on a somewhat less liberal basis—about 40 per cent. of the total nutrients in the ration—that carcasses of equal quality to those from pigs on meal feeding are produced. On the whole proportion and quality of fat are improved.

Area Required for Crop

The area of fodder beet required can be estimated only by the farmer on the basis of soil type and the time and attention he is prepared to give the crop. Until one becomes familiar with the crop a good rule is to concentrate on a small area and handle it well. However, as an example of the method which may be used to estimate the area required, a typical farm carrying 5 sows and a boar may be taken. In addition to that needed for the breeding stock, beet is required for the following purposes:—

1. To finish 10 pigs to baconer weight.
2. To finish 20 porkers.
3. To winter 10 pigs as stores gaining ½lb. per pig per day and finished as baconers in October.
4. To contribute to rations of May and June farrowed pigs until adequate milk is available.

These requirements may be assessed as follows:—

	Total fodder beet lb.
6 head of breeding stock @ 25lb. of beet for 120 days	18,000
10 pigs from 100lb. to 200lb. liveweight @ 20lb. of beet for 60 days	12,000
20 pigs from 60lb. to 120lb. liveweight @ 16lb. of beet for 50 days	16,000
10 pigs wintered from 50lb. liveweight and finished to bacon ..	25,000
20 pigs wintered on sows @ 5lb. of beet for 40 days	4,000
	75,000

If a crop of 35 tons per acre can be grown and used fully, 1 acre would supply these requirements.

A drawback to the provision of any root crop for feeding to pigs is the harvesting and feeding out which are usually involved. These tasks enter largely into the costs of production of the crop and if they can be eliminated, it will make the growing of crops for pigs more attractive.

The "hogging down of corn" as practised in the mid-western States of the U.S.A., grazing off of green crops such

FODDER BEET FOR PIGS . . .

as rape or kale with pigs, and turning pigs on to a crop of artichokes to allow them to harvest the tubers themselves are examples of feeding of crops without harvesting.

Fodder beet will produce a much greater yield of nutrients per acre than any of the above crops. An estimate of the total digestible nutrients produced by an acre of well-cultivated ground in various crops is given in Table 4.

TABLE 4—COMPARATIVE VALUE OF VARIOUS CROPS GROWN FOR PIGS

Crop	Yield (tons)	Total digestible nutrients per acre
Fodder beet	35	15,000
Sugar beet	30	15,000
Mangolds	60	12,500
Carrots	30	7,500
Chou moellier	40	7,500
Lucerne hay meal	5	5,000
Maize	80 bus.	3,750
Artichokes	6	2,250
Barley	60 bus.	2,250
Pasture (autumn and winter growth only)	1 acre	2,000

If a practical method of feeding fodder beet in situ to pigs can be found, the economy of production of the crop can be improved in any or all of the following ways:—

1. Handling and transport costs will be eliminated. (The cost of break fencing is substituted, but it will be much lower.)

2. When utilisation costs are reduced, production expenses need not be pared below those required to give maximum yield, and more intensive production should result. Bigger yields should result in still lower unit production costs.

3. Soiling of the grass paddock where beet is fed out is avoided.

At the Ruakura Animal Research Station piggery during the past season crops of approximately ½ acre each of fodder beet and maize were grown in strips of 5 chains x 1 chain separated by a grass strip. These crops were fed in situ with the use of a single-wire electric fence at right angles to the line of the strips. The fence was shifted to give a fresh break each day according to the stock to be fed.

The crop was used by breeding stock and very complete utilisation was effected. There appears to be no reason why on the free-draining soils which are best suited to beet growing this feeding method should not be used for all purposes already suggested.

If the cropped area, grown in strips of different crops if desired, were first subdivided by fences to break the whole crop up into areas required by each class of stock to be fed, the pigs could be allowed to feed on the crop for a period each day, being encouraged to come home to the piggery by hand feeding of meal in the evening.

Conclusions

In suitability to the pig's digestive system and yield of nutrients per acre fodder beet is an outstanding crop. Sufficient experience with it in New Zealand is now available to justify the recommendation that every farm producing pigs should grow 1 acre of the crop per 5 sows or, where preferred, ¾ acre each of fodder beet and maize. With the latter cropping system very little meal need be purchased—only a little meat meal or other protein-rich feed.

Pig House Plans

PLANS of four types of pig house which have been approved by the New Zealand Pig Producers Council and produced by the council and the Department of Agriculture are now available from either district pig councils or local offices of the Department at 2s. 6d. each. Accompanying each set of plans is a description of the building with the underlying principles of the design, which it is necessary to appreciate so that the most effective use may be made of the house.

The plans and elevations show the dimensions of the buildings and cutaway drawings give a view of the internal layout. Because of differences in availability of materials in different districts specifications are not included, but farmers can work out the quantity of material they require from the dimensions shown.

A well-grown crop of fodder beet represents one of the cheapest sources of feed available. The more thorough the cultivations are both before and after seeding and the better the fertility status and manuring are the cheaper the resulting feed will be on a unit basis. New Zealand's favourable climate enables exceptionally good crops to be grown, if early and thorough cultivation methods are used, the seed is sown early, and subsequent care of the crop is equally thorough.

Silver Jubilee of Soil Bureau

A PUBLIC exhibition of the value and scope of the work of the Soil Bureau of the Department of Scientific and Industrial Research will be part of the celebration in September of the silver jubilee of the Bureau. The results of the Bureau's research are widely used in agricultural extension work, but the way in which the benefits are made use of for practical application may not always be apparent to the farmer.

The Bureau was formed in 1930, when it became clear as a result of stock problems that soils influence the pastures growing on them and the stock they support. Since then it has made fundamental studies of New Zealand soils that have had marked effects on land use and management.

As part of the celebrations a conference on soil work is to be held in Wellington from 13 to 17 September at which the guest speaker will be Dr. E. W. Russell, a world authority on soils from Oxford University. The exhibition of the Soil Bureau's work will be held in its laboratories at 54 Molesworth Street on the evenings of 20 to 22 September.

Meteorological Records for July

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	201	50.7	+ 0.2	65.0	31.9	7.74	18	+ 0.05	3.75	17	153.1
Auckland	160	50.8	— 0.6	62.7	37.1	3.68	17	— 1.78	0.87	9	160.0
Tauranga	10	47.8	— 0.9	60.7	31.3	6.13	17	+ 1.09	2.47	18	153.3
Ruakura	131	45.2	— 1.3	60.3	23.8	4.18	16	— 0.55	1.01	18	135.5
Rotorua	975	44.3	— 0.9	59.0	28.4	5.84	15	+ 1.20	2.34	18	126.4
Gisborne	12	47.9	+ 0.2	62.9	33.7	12.23	19	+ 7.82	2.93	14	98.2
New Plymouth	160	47.6	— 1.3	59.0	35.2	4.76	16	— 1.60	1.30	18	153.1
Karibi	2125	39.8	— 0.6	55.0	20.0	3.86	16	— 0.33	0.73	13	
Napier	5	47.3	+ 0.0	63.2	31.5	8.31	22	+ 4.88	1.71	13	97.1
Wanganui	72	46.1	— 1.5	60.1	30.8	4.08	15	+ 1.16	1.11	21	140.0
Palmerston North	110	46.4	+ 0.3	60.7	28.8	4.34	17	+ 1.30	0.95	1	115.2
Waingawa	340	43.8	— 0.7	60.0	26.5	9.68	20	+ 5.74	2.16	1	79.2
Wellington	415	45.6	— 0.7	57.2	35.3	9.09	22	+ 3.73	1.84	19	90.5
Nelson airfield	5	42.3	— 1.0	58.9	21.0	3.59	14	+ 0.36	1.02	18	140.0
Blenheim	12	43.6	— 0.5	62.8	26.0	2.24	14	— 0.37	0.54	1	145.9
Hokitika	15	44.6	+ 1.0	63.2	27.0	5.34	12	— 3.16	1.70	10	127.9
Hanmer	1270	36.1	— 2.4	57.0	20.0	9.47	13	+ 5.27	3.44	21	93.1
Christchurch	22	41.6	— 0.7	61.3	24.3	3.45	14	+ 0.85	0.82	13	101.2
Ashburton	323	39.4	— 1.7	62.0	21.8	4.73	10	+ 2.11	0.94	11	104.5
Timaru	56	39.6	— 1.8	57.8	24.6	2.13	13	+ 0.40	0.65	21	119.8
Alexandra	520	34.8	— 1.5	51.2	20.0	0.44	5	— 0.22	0.23	20	85.8
Taieri	80	39.0	— 2.0	58.4	21.8	5.18	12	+ 3.24	2.44	21	105.0
Invercargill airfield	0	38.6	— 1.9	53.9	20.1	2.59	13	— 0.22	1.03	20	104.5

Poultry Housing Requirements in the North Island

By S. G. HADDON,
Poultry Instructor,
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THOUGH this article makes repeated references to conditions in the Auckland district, the types of laying houses described are generally suitable for the North Island. Poultry houses up to 40ft. deep are being built on both sides of the North Island, but particularly on the eastern side, for example in Hawkes Bay. Comments on the internal fittings of a laying house apply to all districts in New Zealand.

THOUGH most poultry housing complies with certain (more or less general) established principles, local conditions of climate and environment may require alteration of these principles or adoption of different ones.

The Auckland area with its large percentage of days with high humidity and high temperature is one such district. There is no doubt that houses built for Auckland conditions with a large expanse of wire netting fronts could be too cold and draughty in other parts of the country. Conversely, houses suitable to colder parts of the country are too confined and airless for successful use in Auckland.

A survey of new sheds in the Auckland district has shown there is a marked trend to the deep house with a high front stud, as opposed to the previous standard type which was comparatively shallow and low. Typical dimensions of the new type would be: Depth from front to back, 30ft. to 35ft. (in some houses as much as 40ft.); height at the back, 7ft., and height in front, 9ft. to 11ft., according to the type of roof used. This is a marked change from the 16ft.-deep shed with front and back studs of 8ft. and 6ft. respectively.

Advantages of Open-front House

An important step forward in housing seen in the modern deep house is the result of the realisation that an extensive open-wire front does not mean a wet floor. In fact experience has shown that deep sheds with open fronts are nearly always drier than orthodox sheds on the same farm. There are several reasons for this. Contrary to general opinion an open-fronted shed is not draughty; wind does not blow in to the same extent and consequently rain is not carried (or driven) in. Any rain which does enter is quickly dried out by direct sunshine. Also the deep shed generally has plenty of litter on the floor and this can absorb surprising amounts of water before becoming wet and sticky.

The deep house is airy, and the large volume of air appears to have a cushioning effect on wind which would otherwise tend to drive in, and finally it is well known that an opening in a wall, such as a doorway or window space, can cause bad draughts. There is no doubt that the restricted front openings of many sheds possess this draught-forming quality, but if these openings are enlarged appreciably, the draughts are eliminated. In the modern deep house the draught-producing openings have been enlarged to expansive non-draught open fronts, and they work.

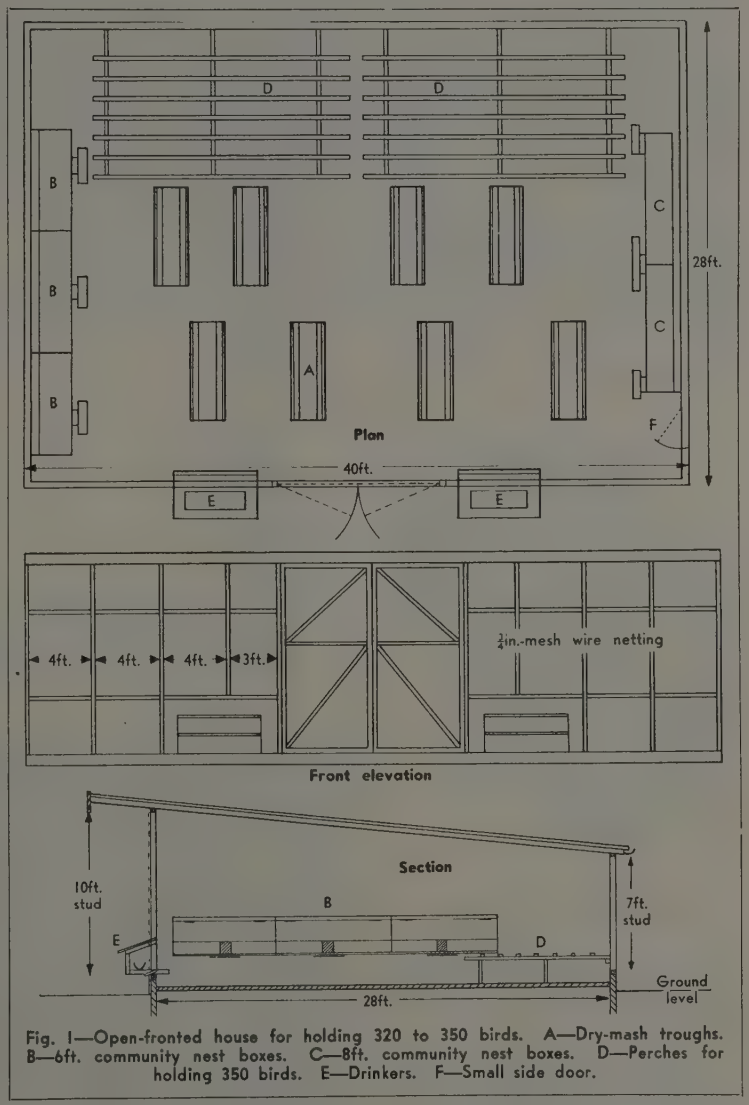

Fig. 1—Open-fronted house for holding 320 to 350 birds. A—Dry-mash troughs. B—6ft. community nest boxes. C—8ft. community nest boxes. D—Perches for holding 350 birds. E—Drinkers. F—Small side door.

Changes in Internal Equipment

Accompanying the changes in size and shape of sheds have been changes in the type of equipment used in them. First, the multiplicity of individual nest boxes has been replaced by the community nest box, which is comparatively easy to build, uses less timber for any given number of laying birds, and goes far toward solving the dirty-egg problem.

Perches have received consideration and in several instances have been replaced very successfully with the perching or roosting mattress, a rectangular wire-covered frame on 20in.-high legs. These mattresses can be

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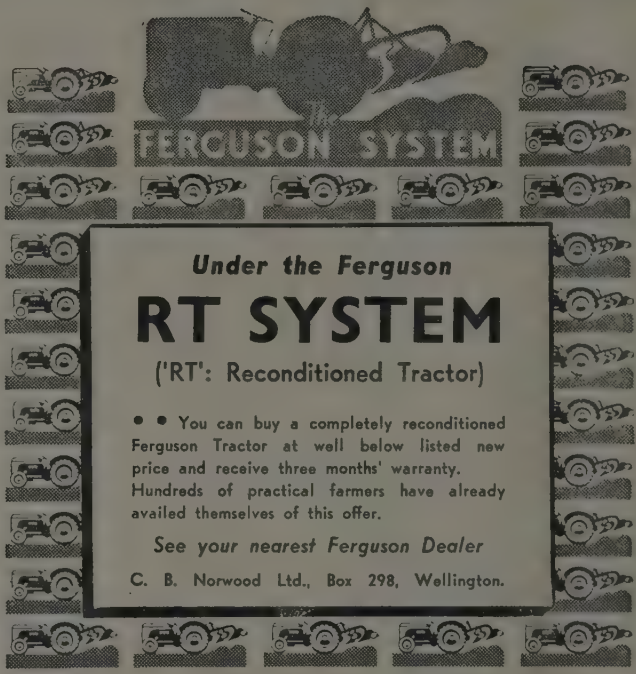

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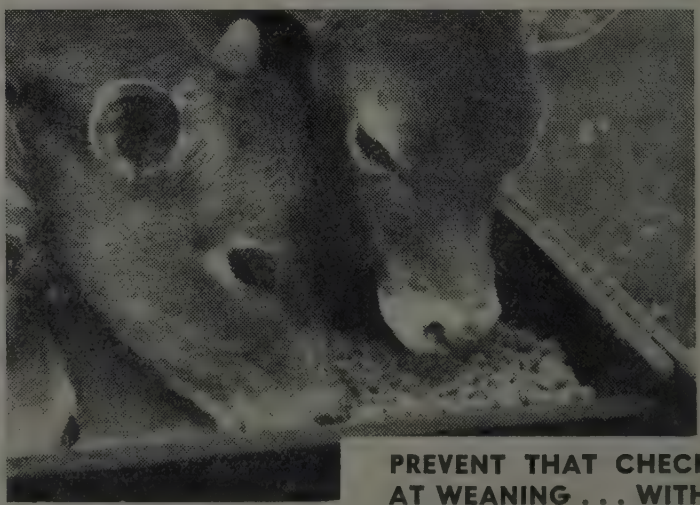

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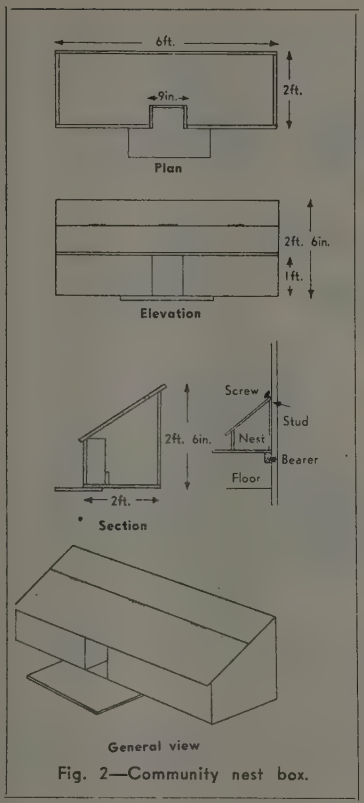


Fig. 2—Community nest box.

moved round the large pens so that there is an even spread of droppings.

Drinking appliances now vary from automatic bowl fountains to drink nipples along the front of the fitting or to the standard domestic ball valve in a 3ft. trough. The arrangement of ball valve and trough is still the most economical to install and is certainly the most satisfactory in use, because it can give absolute freedom from spilt water in the shed and yet will permit a big number of birds to quench their thirst rapidly.

The big disadvantages of the nipple system are the cost of installation, the care required in drilling or tapping a pipe to take the nipples, the fact that birds cannot quench their thirst quickly and easily, and the important fact that adequate water from drink nipple systems inevitably means a wet patch all along the front of the shed underneath the line of nipples. This steady drip, which cannot be avoided, must be caught and drained away by special trays, which must be installed and which add cost and complexity to the system. The automatic fountains cannot be cleaned conveniently and because of their siting inside the pen are an overflow danger. None of these disadvantages applies to the ball-valve trough, which can be installed outside

Fig. 3—These water troughs fixed outside an intensive laying house are fitted with a ballcock to control the water supply. Such troughs reduce to a minimum the amount of water spilt inside the house on the litter, and they can be emptied and cleaned easily from outside the house. An objection is that they are exposed to the sun in hot weather.

the pen but still allows birds easy access to it from inside the pen.

Deep, open-fronted sheds are commonly used to house birds in larger units than flocks of about 100. Being deep and high, these sheds can house birds at less than 4 sq. ft. per bird. Even so, 3 sq. ft. per bird is the absolute minimum, but in many cases flock health and production will be markedly improved by increasing this figure to 3½ sq. ft. per bird.

Even before sketch plans of a new shed are drawn some decisions must be made. These include the size of flock to be housed; the type of roof to be used, because this will influence the stud height; the depth of house, because this may be the decisive factor controlling the type of roof; whether the front is to be entirely open, and so on. It is convenient to work in multiples of 4ft. for depth and width, as the standard width sheet of asbestos cement wallboard then works in better. If some other material such as concrete blocks, timber, or iron is to be used, the 4ft. multiple is not so important. Corrugated iron or aluminium still makes the best roofs.

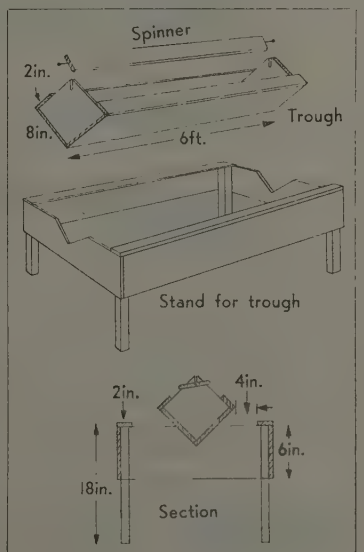


Fig. 4—Dry-mash trough for 50 birds.

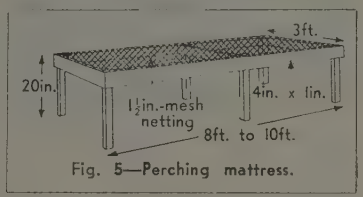
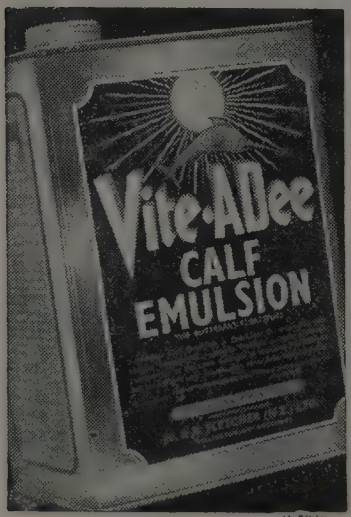


Fig. 5—Perching mattress.

Choice of Roofs

The choice between a lean-to roof or a span roof (gable), either central or two-thirds apex, is largely a matter of personal preference. The span roof is stronger than a lean-to but usually requires more timber. There is little difference between the amount of iron or aluminium used in a lean-to roof with a front overhang or a span roof on the same building. In buildings of up to 30ft. depth a lean-to roof could be built, but for depths greater than 30ft. the two-thirds span or central ridge roof is probably a better proposition.

Fig. 1 shows plans for an open-fronted house, 28ft. deep by 40ft. long, with a lean-to roof, and capable of holding 320 birds, though 350 could be housed at a pinch. Stud spacings can be varied and can be decided by the builder on the job according to the material he uses. The fittings, shown



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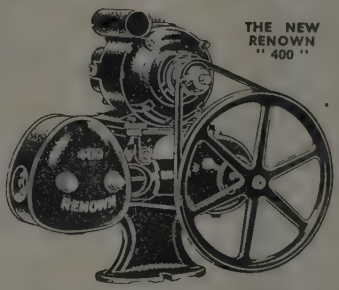

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in detail in Figs. 2, 4, and 5, are a community nest box, non-spill dry-mash trough capable of holding close on 1 week's supply of mash, and a perching mattress. A pair of 5ft. doors is shown on the front wall. These are to facilitate cleaning out, as a truck or cart can be backed into the pen. A service door is shown at one end of the front wall, but this could be in a side wall if desired.

Roosting Mattresses

If roosting mattresses are used in place of perches, approximately ¾ sq. ft. of mattress per bird should be allowed. In practice a frame 3ft. wide and 10ft. long would probably accommodate 40 to 50 birds. Convenience of handling must be considered when these mattresses are built. A frame 3ft. wide and 10ft. long is unwieldy; two smaller frames would be better. Three feet is the standard width of wire netting, so this fixes the width of the mattress frames, leaving the length as the variable measurement.

Fig. 5 gives details of a roosting mattress. The frame is of 4in. x 1in. dressed timber, with the top inside edge bevelled. A cheaper grade of ungalvanised wire netting used by plasterers as a foundation is available. This wire netting in 1in. or 1½in. mesh is quite satisfactory, but the galvanised netting could be used if preferred.

Houses for Smaller Flocks

So far this article has dealt with housing on a commercial scale. There need be no departure from the foregoing principles for housing for smaller flocks in the Auckland area. Fig. 6 shows sketch plans for a shed 16ft. deep and 14ft. wide which will accommodate up to 50 layers quite safely. Tne lean-to roof is again used, and there is plenty of wire netting on the front of the shed. The same type of shed, scaled down to 9ft. wide by 12ft. deep, will accommodate up to 25 birds safely. For the smaller shed one community nest box 4ft. long will be ample. Detailed specifications are beyond the scope of an article like this. In any case local building by-laws will determine to a large extent the type of foundation permissible and the type of floor (earth, wood, or concrete) that can be used. The plans presented here are not the only ones which can be used. There are many variations according to circumstances, but they should be a guide to future building programmes.

There are not yet sufficient records to show whether flocks in open-fronted houses produce a significantly higher number of eggs, but this type of house does permit larger numbers to be housed in one building and to that extent cheapens the cost of production. Against this, however, must be set the fact that birds in small lots well housed will give a higher average egg production than the same quality birds well housed in large lots. The choice is one for the individual.

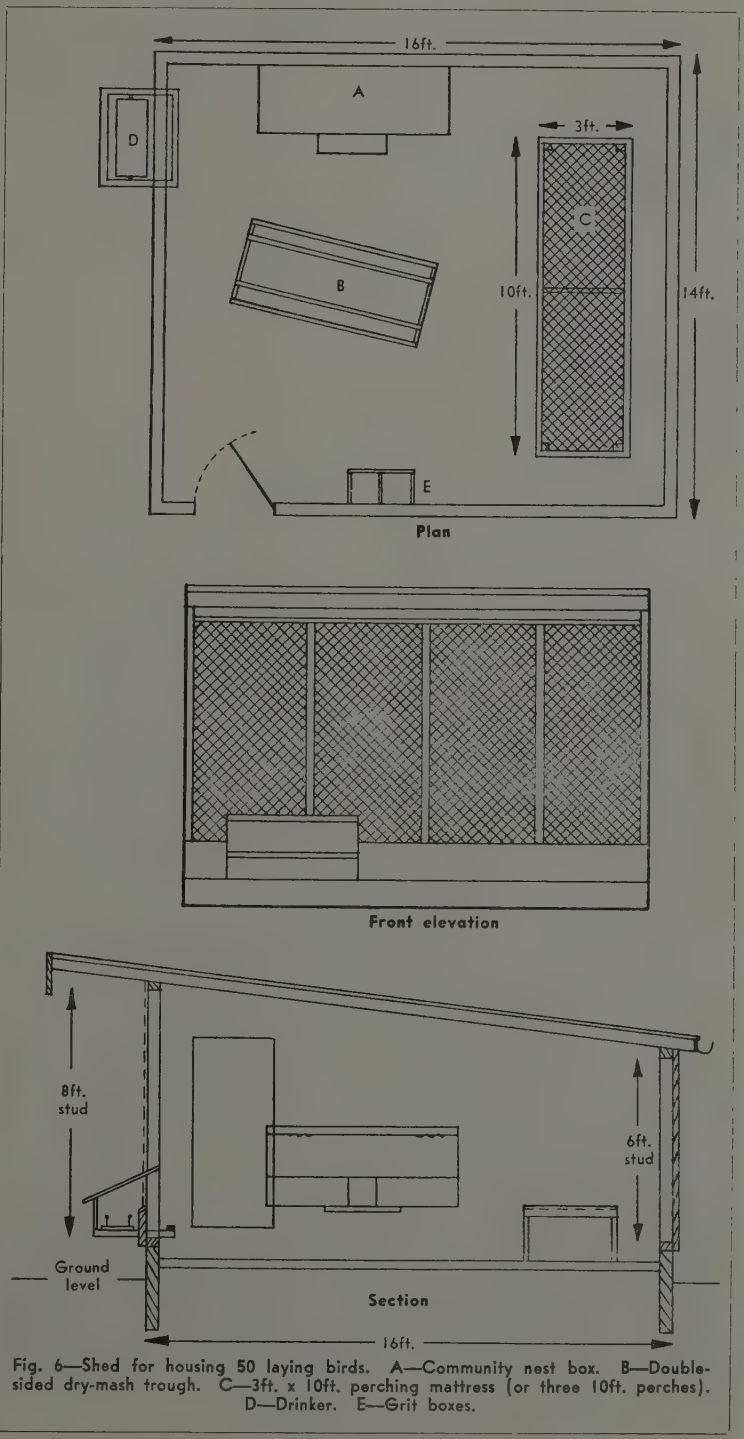

Fig. 6—Shed for housing 50 laying birds. A—Community nest box. B—Double-sided dry-mash trough. C—3ft. x 10ft. perching mattress (or three 10ft. perches). D—Drinker. E—Grit boxes.

High Contents of Soluble Salts in Soils Cause Decline in Yields from Glasshouse Tomatoes

Effects of high salts content in soil on tomato plants. Those at right show stunting and spindly growth and those in middle and left background flagging of upper leaves and blossom drop.

THE use of steam or chemical sterilisation of glasshouse soils to control diseases and pests has made possible the growing of tomato crops in the same soil year after year without replacement of the soil. In many glasshouses, however, a serious decline in growth and yields has been noted. Investigations at the Department of Agriculture's Rukuhia Soil Research Station, Hamilton, have demonstrated that the trouble in many cases is due to high concentrations of water-soluble fertiliser residues or "soluble salts". The nature of this problem, methods of diagnosis, and practical methods of correction are discussed in this article by K. J. McNaught, Horticulture Liaison Officer at the Station.

SINCE 1949 Horticultural Instructors have submitted more than 500 soil samples from tomato glasshouses for analysis by the advisory soil-testing service. High contents of water-soluble materials have been found in a considerable proportion of the samples. During the past 3 years a detailed study has been made of this problem.

The term "soluble salts" is used to include all water-soluble substances, such as sodium chloride (common salt) and sulphate of potash, which ionise in solution; that is, which separate into positively and negatively charged particles, or ions, which will conduct an electric current. Use is made of this property of conductivity in analysis of soils for their content of soluble salts.

Adverse Effects of Salts

Though part of the effect may be due to toxic amounts of some ions, such as chloride ion, the evidence is that the main effect is on **water uptake** by plants. In a given soil two main factors determine availability of water to plants: 1, moisture content of the soil, or more precisely degree of saturation of the soil with water; and 2, osmotic pressure of salts dissolved in the soil moisture.

1. Soil moisture stress or the soil factor in water availability: After thorough watering of a free-draining glasshouse soil the moisture decreases within several hours toward a value known as **field capacity**, which represents approximately the moisture held by the soil particles against the pull of gravity. At this stage a force of about one-third of an atmosphere (5lb. per square inch) will be necessary to squeeze out any moisture from the soil. (In the laboratory a more convenient reference value is **moisture equivalent**, which is similar to field capacity in most soils, but slightly higher.)

Subsequently the moisture content drops more slowly toward wilting point. At permanent wilting point it

is necessary to apply a pressure of about 15 atmospheres (225lb. per square inch) to force out any moisture. In practice no glasshouse soil would be allowed to dry out to anything approaching this extent while the crop is growing. However, at intermediate conditions of drying, the moisture stress or force required may amount to several atmospheres. This means that as the soil dries out the plant has to expend more energy to obtain the water necessary for growth and to offset transpiration losses from the foliage. The greater the amount of energy expended in this way the less there is available for plant growth.

2. Osmotic pressure of dissolved salts and water availability: If two solutions of different strengths are separated by a membrane, water tends to move into the solution of higher concentration, setting up a force known as **osmotic pressure.** The greater the concentration of dissolved salts is the higher will be the osmotic pressure.

In plant sap the concentration of dissolved substances is normally much higher than that in the surrounding soil moisture, with the result that water tends to move through the cell walls of the roots into the plant sap. As the concentration of dissolved salts in the soil moisture increases, the ease of this movement of water into the plant decreases and more energy has to be diverted by the plant to obtaining its moisture needs; that is, less energy is available for plant growth. A soil with a high content of soluble salts is physiologically a dry soil.

The result is that growth tends to be retarded in proportion to the magnitude of the **combined soil moisture stress plus osmotic pressure of the dissolved salts.**

Diagnosis of Soluble Salts

Symptoms

Symptoms of high soluble-salt content are generally characteristic of effects due to lack of water, often despite apparently adequate soil moisture. Typical effects at different growth stages are as follows:—

Early growth stage: Plants remain spindly and "hard" with dark foliage and are rather like plants grown under cold conditions. Affected plants appear to be more susceptible to attack by root-rot organisms. Conditions conducive to root-rot, such as poor drainage, are often conducive to salt accumulation, as such soils are not subject to the same amount of washing that a free-draining soil usually receives. Sometimes, when the plants are in ridged rows, stem burn like collar rot or accompanying collar rot may be found.

Hardening through high contents of soluble salts (or withholding of water) can usually be distinguished from effects of cold soil or air temperatures. The latter effects are often found only near doorways or side ventilators, but soluble-salt effects are usually found in patches throughout the house. As temperatures rise cold-hardened plants usually develop normally and toward the middle of the season may be indistinguishable from initially unaffected plants, but plants affected by salts, if not specially treated, may remain stunted and spindly and produce correspondingly small trusses and low yields.

In extreme cases the plants may remain for weeks or even months at approximately the same size as when planted out. Where some growth has been induced by watering and further water is then withheld the tops of tomato plants may flag severely during the heat of the day, but usually the plants at this young stage adapt themselves to the unfavourable root environment by forming hard and diminutive plants which often show surprisingly little evidence of wilting.

Middle growth stage: Where the trouble has not been sufficiently severe to prevent growth the stems may be noticeably thin and the leaf size less than in normal plants. Height of plants is usually reduced and development delayed. Blossom drop may be severe, especially in the third and fourth trusses, resulting in serious reduction in crop yields. (Blossom drop can, of course, be produced merely by withholding water.) Plants affected by tobacco mosaic virus may show similar blossom drop effects and some stunting, but the virus is readily detectable by visual symptoms. Blossom-end rot sometimes occurs.

Late growth stage: Where water is used sparingly early collapse of the lower leaves is typical. (This can also be caused by potassium deficiency or by leaf-mould, and a somewhat similar collapse can occur with root-rot and other diseases.) Succulent, well-developed plants affected at a mature stage by high concentrations of soluble salts in the soil moisture, due for example to withholding water or over-generous side dressings, may show serious flagging in hot weather, but where the effect has developed gradually the plants may show no abnormal wilting. Where the salt content is high there is a conspicuous absence of the normal white roots near the soil surface. When the plants are lifted at the end of the season horny roots are commonly found.

Weed growth: Where straw or animal manure has been used and the soil chemically sterilised, rather than steam sterilised, weed seeds can be expected to germinate. If weed growth is conspicuously poorer in the parts of a glasshouse where growth of the tomato plants is also poor, high content of soluble salts can be suspected.

Sub-clinical effects: It should be emphasised that mild effects of water stress due to salts may pass undetected, especially as the grower prefers somewhat hard plants to very succulent growth. Even mild cases, difficult to detect at the time of flowering, may result in significant crop losses through subsequent blossom drop, especially when watering is delayed too long.

Analytical Diagnosis

The method used at Rukuhia for all advisory samples to date has been to shake for 1 hour a weighed amount of air-dried soil with five times its weight of water and determine the conductivity of the resulting suspension at 25 degrees C. Such 1 : 5 extracts of estuarine soils have a conductivity roughly related to the weight of soluble salts by a factor of 300. This has been used in the present work, as "per cent. soluble salts" in the soil is easier to understand than conductivity values.

Fruit truss severely affected by blossom drop caused by high salts content in soil.

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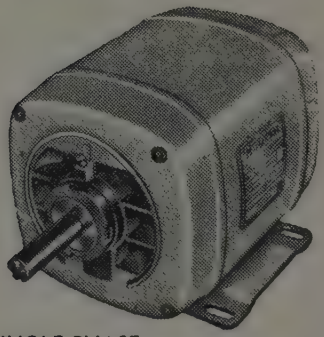

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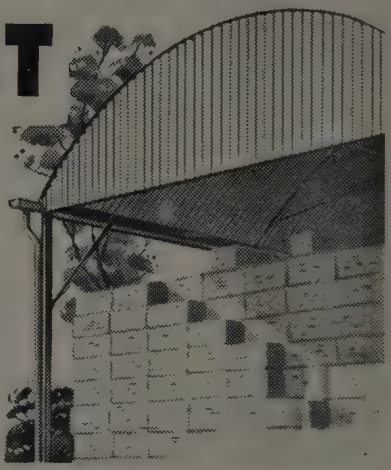

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Comparison of Good and Poor Plants

Table 1 provides evidence of the connection between high content of soluble salts and the occurrence of stunting and reduced yields. In this table soils associated with good and poor plants in the same houses are compared under conditions where the growth differences are not attributable to pathogenic disease.

TABLE 1—PERCENTAGES OF SOLUBLE SALTS AND INCIDENCE OF SYMPTOMS

District	Affected plants	Healthy
Auckland		
Birkdale	0.66	0.39
Henderson, 1953 ..	1.05	0.86*
1954 ..	1.09	0.66*
Mangere	0.77	0.26
Hamilton		
House 1	0.66	0.39
House 2	0.88	0.36
Hastings	0.49	0.26
Palmerston North ..	0.81	0.38
Tauranga	0.45	0.16
Wairoa	0.66	0.36
Wellington	0.75	0.42
Christchurch		
Woolston	1.09	0.57*
Heathcote	0.50	0.40

* The plants associated with these soil tests, though relatively healthy, were still affected by salts.

A similar contrast in values has been found in comparison of soils associated with plants affected by salts before flooding and healthy after corrective treatment.

Tolerance Affected by Water-holding Properties

Some soils hold much more water than others. Fibrous peats, which act like a sponge, may hold more than their own weight of water. At the other extreme, coarse sands low in organic matter, may be unable to retain more than 10 to 15 per cent. of their own weight of water after thorough watering. Tomato soils so far examined in this work have shown moisture contents (moisture equivalent values) ranging from 24 per cent. for a sandy silt in Christchurch to 54 per cent. for an Auckland estuarine (or "alluvial") soil. Many of the soils of volcanic origin used for glasshouse tomato growing in the Auckland Province tend to have higher values for moisture equivalent and field capacity than alluvial silts of the Wellington Province and the South Island.

It is not the concentration of soluble salts in the soil but in the **soil moisture** which determines whether plants will be affected. If tomatoes tolerate a maximum of 0.5 per cent. of soluble salts in a soil of 50 per cent. moisture content, they will stand only 0.25 per cent. in a soil of half this moisture content, both soils having a concentration of 1 per cent. of salts in the soil moisture. For the satisfactory interpretation of results, therefore, the approximate moisture content of the soils under normal field conditions must be known.

Critical Levels

The critical level or dividing line between the soluble salt levels associated with healthy and mildly affected plants must fall below the higher level of each pair in Table 1 and above the lower levels where these are associated with truly healthy plants. Relatively healthy plants may still be adversely affected by high concentrations of salts in the soil moisture and this adds to the difficulty of arriving at reliable criteria from field evidence. Table 2 gives estimated critical levels for some of the important glasshouse soils:—

TABLE 2—CRITICAL PERCENTAGES OF SOLUBLE SALTS

Soil description	Districts	Typical moisture equivalents per cent.	Salts per cent.
Alluvial			
Sandy loams	Christchurch, Manawatu ..	25 to 30	0.28 to 0.34
Light silt loams	Christchurch, Nelson, Hutt Valley, Manawatu	30 to 35	0.34 to 0.38
Heavier silt and clay loams	Blenheim, Christchurch, Oamaru	35 to 45	0.38 to 0.47
Volcanic			
Red-brown loams from basalt	Auckland, North Auckland ..	35 to 45	0.38 to 0.47
Yellow-brown loams ..	Waikato, Tauranga	37 to 54	0.40 to 0.54

Calculations have been based on typical moisture contents at planting out or before watering is begun. The figures are averages, as osmotic pressures depend on the nature of the salts, some having greater osmotic effects than others at the same conductivity level.

The moisture-holding properties of soils unfortunately are variable and not always predictable from their texture. Their organic matter contents may be more important than their clay contents.

Optimum Levels

Analyses show that most of the components of soluble salts are plant nutrients. There should therefore be an optimum level as well as an excessive level. It is difficult, however, to set such an optimum, as in soils there are usually large reserves of plant nutrients which are not immediately water soluble but are slowly released in a form available to plants. In practice, too, the water-soluble components are often badly balanced and as the critical level cannot be defined exactly, it is wise to set a lower peak for the desirable range. The suggested optimum range is one quarter to one half of the critical level.

Survey Results

Table 3 shows a summary of results of analysis for percentage of soluble salts (conductivity x 300 on 1:5 extracts) on samples analysed up to the end of 1954. Most samples were taken to 9in. depth, but Auckland samples were taken to 12in.

The distribution of samples was as follows (100 research samples from 6 glasshouses in Hamilton omitted to avoid undue weighting of the evidence):—

Number of samples with tests between 0.02 and 0.20 per cent. = 207; 0.21 to 0.30 = 81; 0.31 to 0.40 = 39; 0.41 to 0.50 = 42; 0.51 to 0.60 = 31; more than 0.60 = 42.

This means that over 25 per cent. of the soils tested showed levels in excess of 0.4 per cent., 16 per cent. in excess of 0.5 per cent., and nearly 10 per cent. in excess of 0.6 per cent. More than one quarter of the houses are liable to be affected in varying degrees by salts.

TABLE 3—SURVEY OF SOLUBLE SALTS IN GLASSHOUSE TOMATO SOILS

District	No. of samples	No. of glasshouses	Range of values per cent.	Average values per cent.
North Island				
Auckland	111	88	0.04 to 1.09	0.28
Gisborne	5	3	0.02 to 0.78	0.42
Hamilton	135	16	0.03 to 1.40	0.40
Hastings	18	14	0.03 to 0.49	0.21
Palmerston North	24	10	0.04 to 2.54	0.44
Tauranga	30	20	0.05 to 1.30	0.31
Wanganui	9	4	0.12 to 0.79	0.27
Wellington	23	19	0.04 to 0.75	0.22
Whangarei	7	6	0.09 to 0.67	0.30
South Island				
Blenheim	25	19	0.08 to 0.60	0.33
Christchurch	94	71	0.04 to 1.09	0.31
Nelson	40	32	0.03 to 0.64	0.16
Oamaru	12	9	0.02 to 0.48	0.20
Total	542	311	0.02 to 2.54	0.31

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About 50,000 country dogs in New Zealand are infected with Hydatid tapeworms, whose tiny eggs are passed on to human beings and stock animals, and may develop into dangerous cysts. Probably between a third and a half of our sheep, cattle and pigs have hydatid cysts, usually in liver or lungs. In stock, hydatid cysts result in the rejection of thousands of pounds worth of meat annually. Country dogs which feed on offal may become carriers of Hydatid tapeworms. The safest and most effective remedy is to dose your dogs *regularly* with arecoline.

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4.4a

Of the three most important districts, Christchurch, Auckland, and Nelson, the last named shows the lowest occurrence of trouble and the lowest average percentage of soluble salts. The relatively low tests on Oamaru soils can be attributed mainly to the normal practice in that district of replacing the soil frequently.

Factors Affecting Build-up

Factors affecting the build-up of soluble salts are as follows:—

1. Fertiliser rates: One of the most important factors is rate of fertiliser application. In glasshouse tomato culture it has been the practice to follow British methods of using very heavy dressings of fertilisers. Only part is taken up by plants and removed with the crop or plant residues. Where a soil is protected by glass from the washing effects of rain and merely kept moist without the addition of excess water, the residues or the excess of fertiliser can accumulate to quite high levels. For this reason older houses are more prone to the trouble than new.

Total rates of soluble fertiliser components above 30cwt. to 40cwt. per acre (75lb. to 100lb. per 1000 sq. ft.) are liable to be excessive after the first two crops, especially if little water is used. Rates of fertiliser used should be approximately those recommended; for example, as set out by S. O. Gillard in Department of Agriculture Bulletin No. 370, "Growing Tomatoes in Glasshouses". Higher rates of potash fertiliser than those suggested in this bulletin should be used on soils with relatively low potash tests.

A survey of fertiliser use in houses from which soils have been submitted for analysis has shown an extraordinary range in fertiliser rates from almost negligible amounts to gross excess. One grower applied 3 tons of sulphate of potash per acre (150lb. per 1000 sq. ft.), another grower 4 tons of blood and bone (200lb. per 1000 sq. ft.), and a third 7 tons of proprietary mixtures (350lb. per 1000 sq. ft.). Such excessive rates are being applied too frequently and emphasise the real need for growers to check their fertiliser rates. If high contents of salts are suspected, side dressings should not be applied. Too often the problem of high salt content is aggravated by the erroneous but well-intentioned advice of other growers to "feed" the affected plants as "they look starved".

2. Type of fertiliser: Analyses of water extracts of tomato soils have shown that the main salts involved are the sulphates, nitrates, and chlorides of calcium, potassium, sodium, and magnesium. Ammonium, phosphate, and bicarbonate ions are normally present in relatively small concentrations, ammonium because it is rapidly converted to nitrate and phosphate because of absorption by clay or organic colloids. Of the main salts, the sulphates and nitrates of calcium and potassium are normally predominant, though proportions of chlorides are sometimes high. Calcium sulphate from superphosphate may be present in quantity in the soil and appear as the major salt in a 1:5 extract, but the true amount actually dissolved in the soil moisture will be much less, as calcium sulphate has low solubility. In the soil solution it can contribute directly an osmotic pressure of only half an atmosphere.

Weight for weight, chlorides have much higher osmotic pressure than sulphates, and nitrates are intermediate. This may partly explain why growers prefer sulphate of potash to muriate (chloride) of potash. Sodium salts have higher osmotic effects than potassium salts, and magnesium and calcium salts the least. Organic sources of nitrogen such as dried blood or blood and bone, though not water soluble as applied, have their nitrogenous components converted by soil micro-organisms to nitrate and contribute to salts build-up, especially when applied in excess or too late in the season to be utilised by the crop. They will, however, contribute less salts than equivalent amounts of nitrogen in the form of nitrate of soda or potash or sulphate of ammonia and are therefore preferable when contents of salts in the soil are high.

3. Effect of ridging: Soil ridged along the plant row to induce additional rooting tends to dry out. Such drier zones attract soluble salts, which may accumulate there to very high levels. Typically the salt contents in the top inch of the ridge are three to four times as high as in the adjacent level or trenched soil. Ridges and raised pathways, especially if relatively dry, act as considerable reservoirs of salts which are difficult to wash out by watering or flooding. Plant rows, therefore, should not be ridged.

Even in level soil the top zone tends to dry out more than deeper layers and salts move toward the surface as the soil dries. Watering drives the soluble components downward again. Results from analysis, therefore, are affected by depth of sampling and time of sampling, especially in relation to watering and side dressing, as well as by location of soil cores.

4. Use of water: A very important management factor in determining whether soluble salts can build up in glasshouse soils is the extent of **washing** of the soil. Growers who have least trouble with salts are usually those who apply large amounts of water to the crop or who practise thorough flooding between crops. In the Auckland area a crop on free-draining volcanic soil may require more than 30,000 gallons of water per 1000 sq. ft. In Nelson and Christchurch the usual requirement is about 10,000 to 20,000 gallons. With lower rates there is a greater risk of salt accumulation. One grower in the Auckland district with soils testing 0.8 to 1.1 per cent. of salts was unable to lower these levels because the maximum water available for each crop was only 6000 to 8000 gallons per 1000 sq. ft.

Remedial Treatments

An opportunity arose in 1952 to check the effect of withholding fertilisers and of flooding and to determine the value of more intense and frequent watering of the standing crop. A grower had increased the base dressings of fertiliser to three times the normal rate on soils already dangerously high in soluble salts. As temperatures rose and the soil dried out severe symptoms appeared. The soil between the worst plants within the row contained 1.1 to 1.4 per cent. of soluble salts in the top 6in. to 9in. and between the better plants 0.6 to 0.8 per cent., but as the rows were ridged these levels would be abnormally high.

Intensive watering of the worst affected areas was tried and as a result the plants improved and produced a small crop in the top trusses, but the over-all average was only 1lb. compared with normal yields of about 5lb. per plant. In this case flooding of the standing crop was feasible, as the soil is free draining and has little tendency to puddle, but the remedial treatment was applied too late.

After the crop was removed flooding was again carried out to reduce salts further and a short-term autumn crop, stopped above the fourth truss, was planted. No fertiliser was used. Plants appeared healthy and the yield was fair for a short-term crop, averaging 2½lb. per plant.

Flooding was repeated before the next crop. The 1953 spring crop received no base dressings of fertiliser and only two normal side dressings of dried blood and one of potash plus dried blood. After the first two trusses had developed a watering heavier than normal was given and a satisfactory crop, averaging 5½lb. per plant, was harvested.

Soil samples were taken at intervals and analysed to follow the progress of the washing treatments. In the 1953 spring crop (planted late) salts tended to increase between planting (29 July) and the beginning of watering (early October), but a drop occurred during the main fruit-sizing period, when watering was heavy. Toward the end of the last period soil samples were taken every 3in. or 6in. down to 24in. The test levels were lowest in the deepest soil zones and indicated that the flooding or heavy watering had been successful in carrying away the salts.

Water Consumption

Water consumption for this crop, including flooding treatments, was approximately 36,000 gallons per 1000 sq. ft. (equivalent to 72in. of rain). The normal total water application in these houses had been about 15,000 to 18,000 gallons, an amount insufficient to wash out the slowly accumulating salts. These figures and analytical results suggest that an additional 15,000 to 20,000 gallons of water per 1000 sq. ft. may be needed to wash out accumulated salts in free-draining soils of this kind (Horotiu sandy loam). Smaller amounts should be sufficient for routine annual treatments and, indeed, flooding should be unnecessary where correct fertiliser and watering rates are used.

Additional water amounting to approximately 40,000 gallons per 1000 sq. ft. was used by one Auckland grower to reduce salts from 0.57 to 0.14 per cent. and increase the average yield from 2½lb. to 6½lb. per plant. Another grower reduced his tests from 0.49 to 0.14 per cent. by using an additional 25,000 gallons per 1000 sq. ft. On the other hand, a grower in Christchurch on a typical silt loam had outstanding success from the use of an additional 5000 gallons per 1000 sq. ft. applied to the growing crop over 2 months. Salts were reduced from 1.1 per cent. to 0.3 per cent. and extremely stunted plants which had not grown since planting out 8 weeks before rapidly improved and after 2 months were hardly distinguishable from neighbouring healthy plants.

Where the soil is very free draining much of the applied water tends to run away, leaving the bulk of the soil only partly wetted and not fully washed. This probably accounts for the higher amounts of water needed for the treatment of open-textured volcanic loams than for alluvial silt loams and naturally wetter or heavier soils. For free-draining soils watering with a sprinkler may be more efficient for washing out salts than hosing.

Effect of Flooding on Salt Components

Of the main components of soluble salts, nitrates have been found on analysis to be the most readily washed out by flooding and then chlorides, with sulphates tending to be most resistant. The ease of removal of nitrates means that a soil with an excessively high content of nitrate may actually become deficient in nitrate through flooding or increased watering.

Optimum Watering

The ideal plant for maximum fruiting appears to be the one whose vegetative growth has been restricted early in the growing season by a moderate moisture deficiency, partly produced by withholding water and partly owing to osmotic stress from fertiliser applications. These conditions ensure maximum rooting and strong lower fruit trusses.

In some healthy soils it may be unnecessary to apply water for several weeks after planting out. A soil with a high content of soluble salts, however, is like an excessively dry soil. Water should therefore be supplied immediately and as intensively as the soil and weather will permit. Plants will bolt only if salts have been reduced to safe levels. If subsequent growth is too rapid and succulent, plants can be checked and hardened off as required by withholding further water, by adjustment of ventilation or temperature in heated houses, or if necessary by increasing the content of soluble salts by applying potash fertiliser.

When levels of salts are high, rates of watering throughout the growing season should be heavier than normal to wash out part of the salts and also more frequent to keep the water content high and thus lower the concentration of dissolved salts in the soil moisture.

Recommendations

Where trouble due to soluble salts occurs the following measures are recommended:—

Fertilisers

While contents of salts are still high withhold or reduce all base dressings of fertilisers and avoid especially fertilisers containing sodium or chloride (muriate).

On no account apply side dressings to affected plants.

When plant growth has returned to normal after heavy watering of the standing crop nitrogen side dressings should be resumed, especially at the main fruit-swelling stage.

After salts have been reduced to normal levels a recommended fertiliser, balanced for the particular soil, can again be used for subsequent crops.

Watering of Crop

Begin watering earlier, use heavier rates, and water more frequently.

Watering should be reduced again when contents of salts have decreased to safe levels.

Watering between Crops

If levels of salts are high at the end of the cropping season, the soil should be intensively flooded (at least 10,000 gallons per 1000 sq. ft. for very free-draining soils and 5000 gallons for heavier soils).

Acknowledgments

The co-operation of Mr. S. K. Glazer of Hamilton and growers in other districts is gratefully acknowledged.

Reference

"Diagnosis and Improvement of Saline and Alkali Soils". Agriculture Handbook No. 60, 1954, United States Department of Agriculture.

Show Dates

THE following are dates and venues of A. and P. shows from October to the end of December:

NORTH ISLAND

October

14 and 15 October—Poverty Bay A. and P. at Gisborne.

19 and 20 October—Hawkes Bay A. and P. at Hastings.

27, 28, and 29 October—Waikato A. and P. at Hamilton.

28 and 29 October—Wairarapa and East Coast A. and P. at Carterton.

November

4 and 5 November—Manawatu and West Coast A. and P. at Palmerston North.

11 and 12 November—Wanganui A. and P. at Wanganui.

12 November—Clevedon A. and P. at Clevedon.

18 and 19 November—Egmont A. and P. at Hawera.

19 November—Bay of Islands P. and I. at Waimate North.

19 November—Waihi A. and P. at Waihi.

24, 25, and 26 November—Auckland A. and P. at Auckland.

December

3 December—Hauraki A. and P. at Paeroa.

3 December—Kaikohe A., P., and H. at Kaikohe

SOUTH ISLAND

October

15 October—Ellesmere A. and P. at Leeston.

21 and 22 October—Marlborough A. and P. at Blenheim.

22 October—Northern A. and P. at Rangiora.

29 October—Timaru A. and P. at Timaru.

29 October—Amberley A. and P. at Amberley.

November

3 November—Ashburton A. and P. at Ashburton.

9, 10, and 11 November—Canterbury A. and P. at Christchurch (Royal Show).

16 November—North Otago A. and P. at Oamaru.

18 and 19 November—Nelson A. and P. at Richmond.

19 November—Waimate A. and P. at Waimate.

19 November—West Otago A. and P. at Kelso.

19 November—Courtenay A. and P. at Kirwee.

26 November—Motueka A. and P. at Motueka.

December

6 and 7 December—Gore A. and P. at Gore.

10 December—Otago Peninsula A. and P. at Portobello.

13 and 14 December—Southland A. and P. at Invercargill.

17 December—Tokomairiro A. and P. at Milton.

How American Foul-brood Disease Can Spread

AMERICAN foul-brood disease (*Bacillus larvae*) has probably caused more loss to the beekeeping industry than any other disease affecting honey bees. As new beekeepers are constantly entering the industry and in some areas bees are now being kept mainly for pollination, the all-important subject of foul-brood should be kept well to the fore. In this article L. A. Griffin, Apiary Instructor, Department of Agriculture, Hastings, outlines ways this disease of the brood can spread and emphasises the vigilance required by every beekeeper to keep the disease under control, so protecting the interests of other beekeepers and the industry as a whole.

THE question is often asked, "How did this disease originate?" or "How did the beekeepers manage before the movable comb hive was introduced?"

Bees were affected with American foul-brood and other brood diseases long before any research in this field was undertaken.

One possible reason why the disease did not become a major problem with honey bees in earlier days was the system of beekeeping then in vogue.

Before the introduction of the movable comb hive bees were kept in simple, cheap, easily constructed hives. In northern countries bees were kept mainly in straw skeps and encouraged to swarm. This increased the number of colonies each year by approximately two-thirds.

At the close of the season the skeps were weighed, and the bees in the heaviest and lightest were sulphured for the honey, the only colonies left being those with sufficient stores to see them safely through until spring, when food would again be available.

This meant that the parent colony, being denuded of bees by swarming, was destroyed each year, and only those colonies—mainly second swarms—on newly constructed combs and possibly skeps new that season were saved for the following year.

This wasteful method of producing honey by the wholesale destruction of bees and combs each year was probably responsible for keeping foul-brood down to the lowest minimum possible.

The movable comb hive, wax comb foundation, and the honey extractor have made it possible to save this destruction of bees and combs each year and to produce larger crops of honey per colony than ever before.

This, however, places a greater responsibility on the beekeeper to be more alert for detecting foul-brood, because combs and other material are now saved from year to year, and if they should become infected with the spores of this disease, will start the disease in any hive on which the combs, supers, or other material are placed.

A corner of a 15-colony apiary, showing damage caused by stock during winter. One of the overturned hives was diseased, and the infected stores were robbed out by other colonies in the apiary, with the result that over 40 per cent. of the remaining colonies were found to be diseased at the first inspection in spring.

The disease can spread naturally in many ways without being assisted by inexperienced beekeepers.

The various ways the spores of this disease can be picked up by the bees will be considered one point at a time from the time the colonies go into winter.

Robbing

The danger of robbing is present at any time of the year when there is little or no nectar available. Though the colonies may have been in good order and free of disease when closed down for winter, it does not follow that they will be in the same condition when opened in spring.

Though the colonies may have sufficient stores to see them safely through winter, when there is a dearth of nectar, there is always room in the hive to store more, and the bees are on the search whenever conditions are suitable for flying.

Any weak, diseased colony within flying range of the apiary, either in a tree, building, or another apiary, can be robbed of its stores, and this infected honey will in turn start the disease among those colonies that took part in the robbing. The source need not necessarily be a diseased colony; any source of infected honey to which the bees have access is sufficient.

A rubbish dump that contained a discarded tin with honey was the probable cause of an outbreak of disease this year in two apiaries about a mile on either side of the dump.

Normally American foul-brood does not spread rapidly through a well-tended apiary, but if a colony that has found a source of infected honey is overturned by stock, there is a great possibility that the bees may not be able to protect their stores and may get robbed or partially robbed out, the disease being so spread to other colonies in the apiary.

Spring Overhaul

With the first spring overhaul of the colonies, as well as the checking of all other conditions a thorough inspection of the brood for disease should be made. To make this inspection it is necessary to shake most of the bees from the combs containing brood back into the hive.

Unfortunately, with many inexperienced beekeepers this is often the only inspection for disease the brood will get during the whole season.

This is wrong. Brood should be checked for disease three times a year—in spring, again before supering, and

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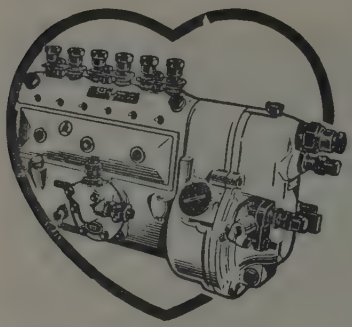

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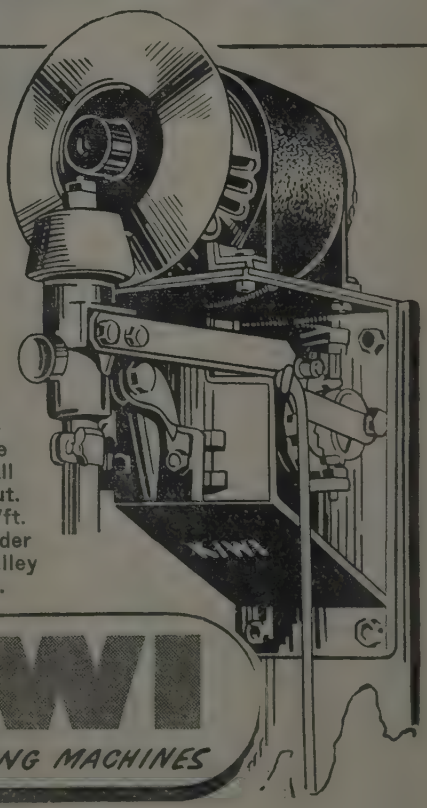

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at the time the honey crop is removed from the hives.

During spring, while the colonies are building up in strength, unless location and climate allow a spring flow or food in excess of requirements is supplied by the beekeeper, the bees are forced to search constantly for food. It is unwise to allow colonies to run short of stores at any period of the year, for in their serious need of food they are more inclined to rob out a weaker neighbouring colony than they would be if their future welfare was more assured.

So though an apiary may have been free of American foul-brood disease at the first spring overhaul, it is possible for one or more colonies to be diseased by the time supers are required on the hives for the main honey flow.

To save infecting more valuable material than is necessary a second check should be made for disease before supers are placed on the hives.

In any manipulation of brood combs during spring or early summer for building up colonies, making nuclei or increase, or for swarm control the beekeeper should be ever on the alert for any cell of disease, for though a district may be considered free of American foul-brood, there is always the danger of infected honey coming into the district from outside.

Diseased Colonies

If disease is found in a colony during any of these inspections, the hive should be closed immediately, the entrance restricted if necessary to a size the bees can safely guard, and the hive left to be dealt with in the evening after all flying has ceased for the day.

If there is any doubt whether it is American foul-brood, an experienced beekeeper should be called in.

Avoiding Spread of Disease

Once he has handled the combs of a diseased colony the beekeeper's hands and tools are also infected. After the handling of an infected hive and before another hive is opened up hands, hive tools, smoker, and other equipment must be thoroughly cleaned or the spores can be carried to other colonies, so spreading the disease.

A very large number of spores are required to infect a healthy colony, but the spores are so small that a square inch of an infected surface can carry sufficient to infect many colonies.

Propolis should be removed first from the hands and tools with a rag soaked in methylated spirit; the hands and tools should then be thoroughly washed with soap and water. The rag must be burnt.

Destroying a Diseased Colony

The diseased colony should be gassed in the evening after the bees have ceased flying.

Not every beekeeper will have on hand material for making hydrocyanic acid gas, but motor spirit is easily obtainable and will do the job just as quickly and effectively.

An easy way is to cover the top of the hive with a piece of old sacking at the time of inspection and replace the cover.

In the evening it is simple to block the entrance and any other cracks that may allow bees to escape, remove the hive cover, and pour sufficient motor spirit—anything from ½ to 1 pint, according to the size of the colony—over the sacking and replace the cover.

Dig a hole 18in. deep and large enough to burn the contents of the infected hive. If the hive is not worth the cost of thorough sterilising, the wisest policy is to burn everything.

Place materials to start a fire in the hole and stack all brood combs and any dry combs or combs containing little honey around first, tent fashion, followed by the combs containing honey.

The dead bees should be placed around the outer edges of the fire last of all, as they are difficult to burn and will choke the fire if thrown on top.

During this operation care must be taken that no honey is allowed to drip on the ground, or even dead bees dropped about the area, as they will get crushed and what honey they may have in their honey sacs, plus any honey dropped, will be there in the morning for other bees to clean up and so start the disease again.

If petrol has been used to gas the bees, care must be taken in lighting the fire, as all material will be highly inflammable.

Stray Swarms

Though stray swarms do not often carry disease, they should always be treated as suspect.

It is much safer to take the swarm in an ordinary box, leave them in this for 36 hours on the site they are to occupy, and in the evening hive them into a new hive on frames of foundation. Any comb the bees have built in the box should be burnt.

Another fairly safe method is to hive the swarm in the evening on frames of foundation, placing one old comb due for discarding in the centre of the brood box. The next morning gently open the hive, using very little smoke, remove the comb, shake the bees off into the hive, and push the frames of now partly drawn foundation together to close the space left by the removal of the comb.

This comb will contain whatever surplus honey the swarm had with them and should be burnt.

Drifting Bees

Where hives are placed close together with entrances all facing in the same direction drifting bees from a diseased colony can carry the spores of disease to a healthy neighbouring colony.

This is usually caused by the young bees joining with other young bees from adjacent colonies during a sun flight and so returning to the wrong hive.

These young bees will take up their cleaning and nursing duties in the other hive as if it was their own and soon infect the brood with the spores carried in, and on, their bodies and mouth parts.

Normally the drifting of young nurse bees from a diseased colony affects only the colonies on either side. If the hives are placed in pairs or blocks of three at safe distances apart in the apiary, the danger of spreading the disease from this type of drifting is localised; any bushes or other location marks around the apiary will also assist in preventing drifting.

Foraging bees usually drift only when they are returning to the hive tired with a load of nectar.

Below—Where disease is present neglected and stock-damaged apiaries are a serious menace to all other beekeepers in the district.

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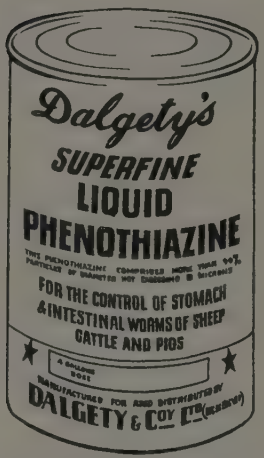

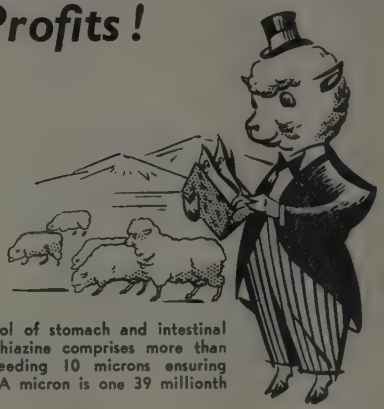

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Drones drift much more than workers, being accepted in almost any hive during the swarming season.

Extracting Combs and Supers

The extraction of combs and supers can be responsible for the spread of American foul-brood to a greater extent than is realised.

If the brood in a hive has not been inspected for disease since the first spring overhaul, and to all outward appearances the colony has built up fairly well by the time supers are required, it is possible for the bees to have become infected during the intervening period.

A diseased colony may store a fair surplus of honey if climatic conditions are favourable during the main honey flow. If these supers of honey are removed from the hive and the combs extracted, without the brood being first checked for disease, the infected combs and supers will naturally get mixed with others during extraction.

Though the diseased colony may be discovered later and destroyed, it would be impossible to trace the combs when spread among many supers.

When these honey combs are used on the hives the following year—this would be after the colonies had been built up to strength for the main flow—they will spread the disease among other colonies and possibly in more than one apiary.

The difficulty here, however, is that in the first instance these combs will usually start the disease in only two or three cells throughout the brood nest. These cells can be easily overlooked. From these few cells, however, the disease soon spreads through the rest of the brood.

Bees have only one set of tools, their tongues and jaws, for all cleaning, feeding, building, and repair work in the hive, so they quickly spread the spores.

By the time the honey crop is ready to be removed from the hives the infected colonies will still appear strong and prosperous, as the disease will not have had time to become apparent without an inspection of the brood.

If the crop is removed and the honey extracted without the brood first being checked for disease, these super combs will again lose their identity during extraction and will cause a serious loss the following year when used again.

Incidents like this are rare, but a case identical with that outlined was responsible for the loss of over 70 hives of bees in six apiaries this year.

Cleaning Cappings

A dangerous practice by some beekeepers with three or four hives is to place the sticky cappings from the extracting combs in trays out in the open for the bees to clean up.

This invites all other bees in the neighbourhood to a free feed. Should one of the colonies be diseased, the disease can be spread around the district, causing not only a greater loss to the beekeeper himself but possibly to others whose bees are within flying range.

Where it is usual to have the cappings cleaned up by the bees this should be done within the hive, one colony only being used.

Place an empty super over the mat on a strong colony, turning one corner of the mat back to give the bees access to this super.

The sticky cappings are then placed in a wire-mesh tray or shallow box with a $\frac{3}{8}$in. wire-mesh bottom. The tray should be raised on blocks about 3in. above the mat to give the bees access to the underside. As the bees clean the cappings of honey the dry wax flakes will fall through on to the mat, where they can be removed later. It is an advantage to have a second shallow tray underneath to catch the dry cappings, as the bees are inclined to remove them from the mat.

Feeding

Feeding honey of unknown origin is another dangerous practice and can easily cause an outbreak of foul-brood.

If honey is bought for feeding, it must be from a known safe source; otherwise sugar syrup or dry sugar feeding is preferable and safe.

Used Hive Equipment

All second-hand hive equipment, unless it is known to have come from a disease-free apiary, should be thoroughly sterilised before use.

The spores of American foul-brood will live for years in hive equipment that has been stored in a shed and which will infect a colony in any hive on which it may be placed.

Sterilising Hive Equipment

There are many ways of sterilising hive equipment, but for the beekeeper with only a few hives an easy and safe way is to remove all wax and propolis with a three-cornered scraper, taking particular care with all corners and edges.

With supers it is necessary to remove the metal rebates. These should be burnt with all the scrapings of wax and propolis, as these may contain millions of spores of the disease. Hands and any tools used must be thoroughly cleaned and washed.

The hive parts can now be scorched to a dark chocolate brown with a painter's blow lamp, particular attention again being paid to all corners and edges.

The practice of stacking supers four or five high, throwing petrol or hay inside the stack, and firing it is wrong. This method always misses the vital parts—the corners and edges.

Unless a thorough job is made of sterilising all infected equipment, it is better and cheaper to burn everything, for such equipment will only cause trouble and further loss in the future.

HOW FOUL-BROOD CAN SPREAD

Used honey containers or tins that have contained honey from hives with foul-brood could be the cause of disease in any healthy colony within flying range.

Care of Livestock during October

Contributed by the Animal Research Division

CATTLE TICK CONTROL

WHERE cattle ticks are plentiful spraying or dipping should be carried out in November and December to prevent tick worry and kill the adult female ticks before they lay their eggs.

MATING OF DAIRY COWS

Before each cow is mated two heat periods or an interval of at least 30 days should be allowed after calving. Cows mated before this period are less likely to get in calf, and the chances of contaminating the bull are increased. Hand mating should be practised and accurate records kept showing the bull used and the dates of all services. Should breeding trouble occur, these records will be of considerable assistance in arriving at a correct diagnosis.

COCCIDIOSIS IN CALVES

Scouring in calves under 6 months of age is seldom due to worms. It is much more likely to be due to coccidiosis, especially if blood is present in the droppings. Effective drugs are available for treatment, but these can be obtained only on the prescription of a veterinary surgeon, who should be consulted.

BLACK DISEASE VACCINATION

In the east coast areas of the North Island where black disease of sheep occurs vaccination should be carried out during November or early December. This will protect the sheep against the disease, which occurs mainly in summer and autumn. Vaccine should be ordered immediately.

BLOOD POISONING AFTER SHEARING

Deaths in sheep after shearing may be caused by infection of cuts or bruises with the blackleg germ. This disease can be prevented by vaccinating at least 3 weeks before shearing. Sheep which have been vaccinated previously may not require revaccination, and a Veterinarian or Livestock Instructor should be consulted about the best procedure.

BLOWFLY STRIKE IN EWES

In districts where crutch strike causes trouble in ewes crutching or early shearing is advised. Close supervision is necessary to detect cases so that suitable treatment can be applied before the strike becomes too extensive. When treating cases of fly strike shear the wool away to leave a 1in. margin of clean skin around the affected area. Remove the maggots by tapping the area with the shears and apply some reliable non-irritant dressing. Irritant fluids such as kerosene tend to cause restrike.

BLACK-HEAD IN POULTRY

Young turkeys and poultry are affected by black-head disease and it can best be prevented by rearing these on land which has not been contaminated by adult poultry. If an outbreak occurs, kill all affected birds and move the remainder to clean ground. In the event of a bad outbreak the local Poultry Instructor of the Department of Agriculture should be consulted, as in some cases treatment may prove beneficial.

GREENLEG IN BROODER CHICKENS

Greenleg in brooder chickens occurs in poorly ventilated brooders, especially if they are over-crowded and damp. At the first sign of trouble the necessary measures should be taken to ensure that ventilation is adequate and the litter is changed if it is at all damp.

ROUNDWORMS IN POULTRY

Infestation by roundworms is one of the most important causes of poor development of young birds. Growing stock should be treated twice with carbon tetrachloride, once at 3 months and again at 5 months.

SUPPLEMENTARY FEED

Supplementary feed is essential to ensure the proper feeding of cows in winter and in dry summers and to control facial eczema in autumn. As soon as more pasture is available than is necessary to meet the immediate needs of stock, the balance should be shut up for silage or hay. On a well-managed dairy farm it should be possible to shut up at least 40 per cent. of the pasture. Crop growing for fattening of weaned lambs is standard practice in South Island districts, and it could with advantage be adopted more widely in North Island districts which experience a dry summer. Crops such as thousand-headed kale and turnips in addition to providing excellent fattening feed for lambs are a splendid insurance against facial eczema. In Poverty Bay and Hawkes Bay they should be sown before the end of October so that they can be well established before dry weather sets in.

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during July and for the year ended 31 July 1955, with comparative figures for the same month and season of 1953-54, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER

Period	Creamery (tons)	Whey (tons)	Total (tons)	Percentage Inc. or dec.
July 1955	1,471	2	1,473	—
July 1954	1,657	9	1,666	—
Increase or decrease ..	—186	—7	—193	—11.585
12 months ended 31/7/55	148,538	2,993	151,531	—
12 months ended 31/7/54	143,440	3,024	146,464	—
Increase or decrease ..	+5,098	—31	+5,067	+3.459

Butter in store at 31 July 1955 was 9,437 tons

CHEESE

Period	White (tons)	Coloured (tons)	Total (tons)	Percentage Inc. or dec.
July 1955	5	2	7	—
July 1954	152	—	152	—
Increase or decrease ..	—147	+2	—145	—95.394
12 months ended 31/7/55	77,314	20,558	97,872	—
12 months ended 31/7/54	99,175	226	99,401	—
Increase or decrease ..	—21,861	+20,332	—1,529	—1.538

Cheese in store at 31 July 1955 was 15,787 tons

If these figures are converted into butterfat equivalent, there is an increase of 2.289 per cent. in butterfat graded for the 12 months as compared with the corresponding period of the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place from time to time they are not necessarily a true indication of production trends.

The Potato Crop: Hill Country Pasture Management

Seasonal Notes by the Extension Division

PREPARATION of land for the coming potato crop should now be well forward, the seed should be purchased, and the fertiliser on hand. Any equipment for planting and spraying the crop should be checked so that the work can proceed smoothly without delays.

POTATO CROP

POTATOES are one of the most important cash crops in New Zealand. Approximately 20,000 acres are grown for commercial purposes each year and normally the total yield is sufficient to meet all demands. Potatoes may be grown on a wide range of soil types, but are particularly suited to heavy, well-drained silt loams on which, in a favourable season, high yields are assured.

Potatoes will fit in practically anywhere in the crop rotation, but generally they are planted after grass and often as a preparatory crop for wheat. Like all other farm crops potatoes respond to good preparation of the soil, and deep, thorough cultivation is necessary for high yields. Preparation of the ground should begin with hustling or skim ploughing in autumn followed by deep ploughing in early winter to obtain the maximum benefits from winter frosts and rains. In early spring repeated hustlings and harrowings are all that are usually necessary to prepare a good seed-bed.

Main-crop planting may be carried out from September onward, depending on locality. At least 3cwt. to 4cwt. of superphosphate or a mixture of 3 parts of superphosphate to 1 part of sulphate of ammonia should be sown with the seed. When a variety is being selected the soil type on which the crop is to be grown and the known ability of a variety to do well in any particular locality should be taken into account. A suitable grade of Certified Mother or Commercial seed should be planted, as the quality of seed is one of the most important factors in the growing of a successful crop.

—J. L. SYMONS

* * *

SPRAYING FOR LATE BLIGHT

IN some districts and seasons the incidence of late blight can be a major contributing factor in the reduction of yield in potato crops. In Canterbury blight attacks are so infrequent that spraying is not economic and in some other districts, even though blight attacks are more frequent, farmers are prepared to take the risk of a reduction in yield. However, in the Pukekohe area spraying as a preventive against late blight is a recognised practice.

The aim in districts where spraying is done regularly is to get a coating of spray material over the leaves, particularly the under surfaces, approximately 2 weeks before the disease normally makes its appearance and then to maintain that coating during the critical period of blight attack. The number and frequency of sprayings needed will depend largely on the weather in the district, but usually sprays at intervals of 2 to 3 weeks will be sufficient. If heavy rain falls between the planned times of application, growers would be wise to apply a spray after the rain.

In districts where spraying is not a recognised practice in potato growing the aim usually is for growers to get a protective coating on crops after what they consider to be suitable weather for the development of blight.

In England and the U.S.A. systems of blight forecasting are being developed. The forecasters believe that late blight can be expected to develop approximately 2 weeks after there have been a minimum temperature of 50 degrees F. and a relative humidity of not less than 75 per cent. for at least 2 days.

—O. G. MOORE

Six-row power sprayer for potatoes. [*Sparrow*

* * *

CLOSING PADDOCKS IN HILL COUNTRY FOR PASTURE CONTROL

DAIRY farmers and fat lamb farmers regularly close paddocks when pastures are making more growth in spring than the stock can control. The mower is used to remove the surplus growth as silage, hay, or a seed crop. Stock meantime are confined to a portion of the farm on which they can control the growth, keeping this area growing good meat- and milk-producing feed. The mown areas are ready for grazing again when the flush is over.

Similar management on hill country farms has been developed in many districts with very definite benefit to the pastures and to the stock, but cattle are used in place of the mower to clean up the surplus growth. As soon as the growth starts to get away from the stock, paddocks which will benefit from a spell are selected and the stock removed to adjoining paddocks, where they help to keep control of the feed. The number of paddocks cleared of stock will depend on the season, but in good seasons up to one in four can be closed.

As soon as the rate of growth falls off the closed paddocks are brought back into good grazing condition for the ewes and lambs by concentrating the cattle on them. After weaning the ewes can be mobbed and used to do the final cleaning up. By careful manipulation of the stock in this way the whole farm, or at least the greater portion of it, can be kept in good grazing order and go into summer with all the area in useful grazing condition.

The aim of this management is to have all the roughage concentrated in selected paddocks where the cattle can deal with it later while the rest of the farm continues to grow meat- and milk-producing feed. Paddocks weak in clovers are good ones to select for spelling, so that clovers can flower and set seed. Late spring and early summer surplus growth scattered over the farm as a result of the usual set stocking of paddocks is neither useful nor ornamental. This growth generally remains uneaten until it becomes dry and of little or no value for stock.

—R. S. WHITEHEAD

Beets are a

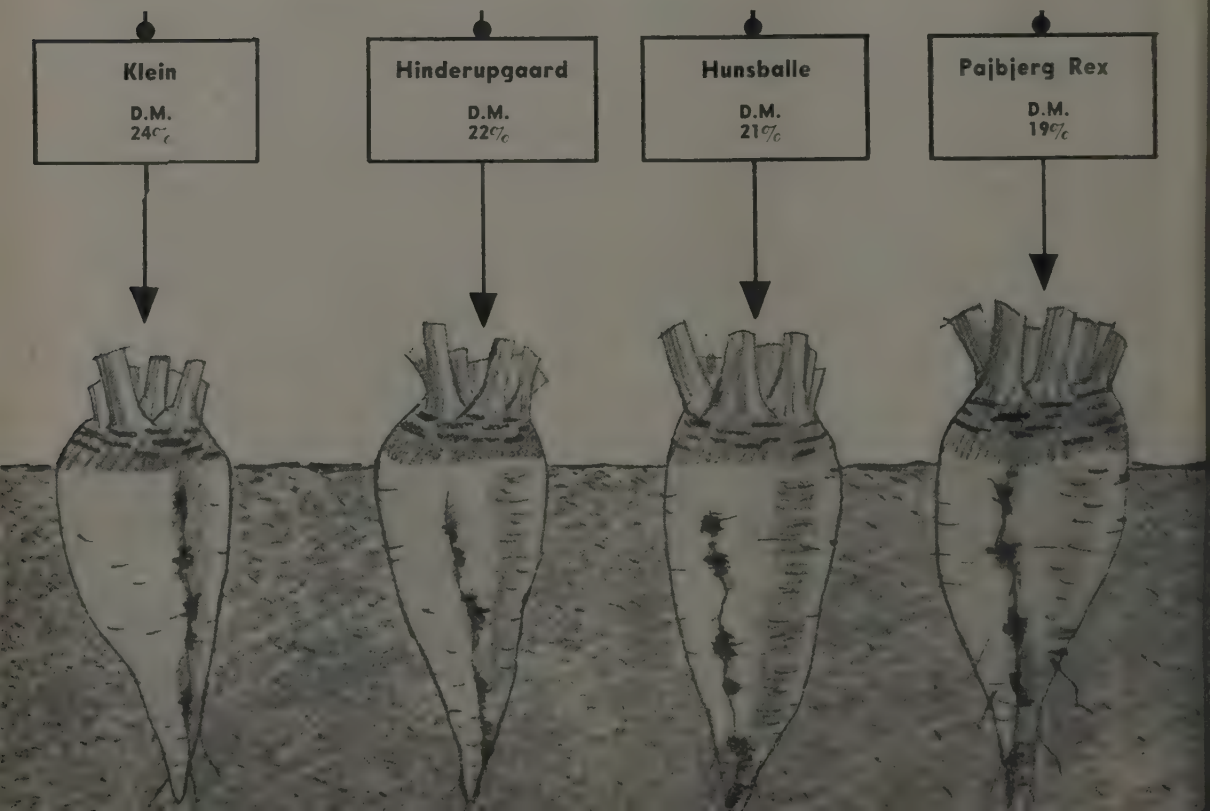
By J. H. CLARIDGE,
Superintendent, Seed Industry, Department of Agriculture, Wellington

CONSIDERABLE interest has been shown recently in New Zealand in the use of certain types of the beet family for feeding to animals, particularly pigs, and in this article the results of a series of trials conducted in the 1953-54 season are summarised.

IN the past the mangold has been the member of the beet family most widely used for stock feeding. Though capable of high yields, mangolds have the drawback of a relatively low dry matter content, and under certain conditions their feeding to pigs has resulted in poisoning.

Sugar beet first came into prominence and is now widely used as a source of common sugar, and the waste products from the processing have found a useful outlet as stock fodder. Sugar beet has also been grown solely for feeding to stock. Though lower in total yield, it has a dry matter content approximately

Fodder beets provide a valuable source of winter feed for pigs.



Valuable Source of Fodder for Stock

twice that of the mangold and a comparable yield of dry matter per acre. It can be fed directly to stock without fear of poisoning, but as the roots are formed entirely below ground level, it is difficult to lift and its rooting system retains an appreciable quantity of soil on the roots.

To overcome to some extent these drawbacks of sugar beet as a stock fodder, selections have been made which are known as "sugar beets for fodder" in areas where sugar beet is grown for sugar. This serves to distinguish them from the types primarily intended for sugar production.

In the last 20 years a type of beet intermediate in growth habit and dry matter content between mangold and sugar beet has been developed in Scandinavian countries and the Netherlands and is now widely grown in those countries for feeding pigs, cattle, and horses.

Confusing Overseas Nomenclature

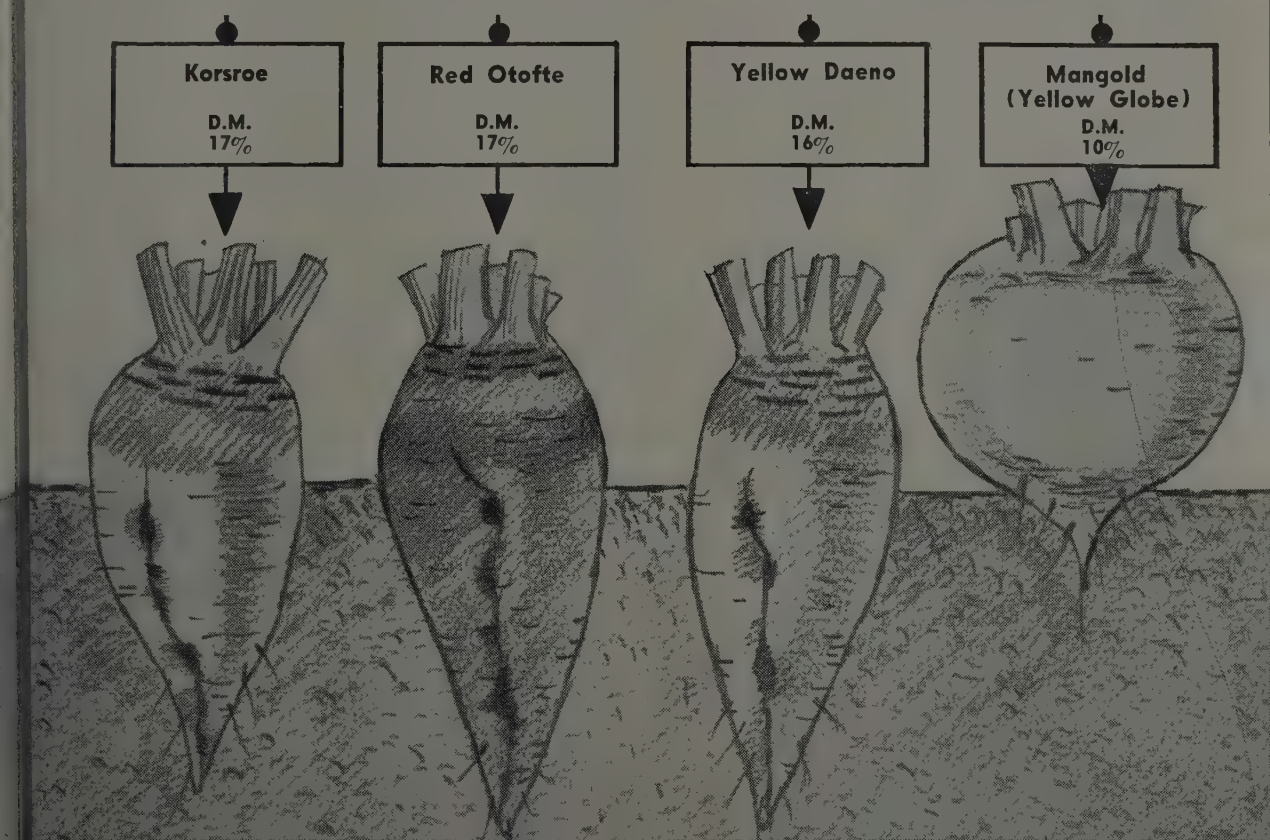
Literature from European countries shows the classification and nomenclature of the beets grown for fodder to vary between countries. The position becomes confused when the descriptive terms are translated into English and an attempt is made to compare them with the previously accepted terms of sugar beet and mangold. Clarification is not assisted by the foreign-looking names and symbols used in the identification of varieties. Here is an attempt to simplify the position as far as New Zealand is concerned.

When one realises that the significance of the Roman numerals following Danish varietal names is to indicate the latest series of state trials in which the particular variety has received approval, one realises that these symbols can be ignored in this country. Further, as sugar beet is not grown in New Zealand to supply to sugar factories, it is not necessary to distinguish between sugar beet varieties raised for that purpose and selections raised for fodder. It then becomes possible to place into one or other of three groups, according to several agronomic characters, the varieties of the beet family which are at present marketed in New Zealand.

(a) **Mangolds** (*Beta vulgaris*): Roots grow appreciably more than half out of the ground and have a dry matter content usually below 12 per cent., though some varieties (classed as Barres) not yet grown in New Zealand are slightly higher in this respect. Mangolds must be allowed to "ripen" by being left out of the ground for a period before feeding; if they are cooked, there is a danger that the nitrite content of the roots will in-

TABLE I—RESULTS OF DANISH TRIALS (4 SEASONS) WITH BEET AND MANGOLDS

	Fresh weights (tons per acre)			Dry weights (tons per acre)			Percentage of dry matter	
	Roots	Tops	Total	Roots	Tops	Total	Roots	Tops
1. Mangolds (Barres types) (4 varieties) ..	29.8	8.6	38.4	3.9	1.1	5.0	13.2	12.6
2. Fodder beet								
(a) Low dry matter (5 varieties)	25.0	9.5	34.5	4.1	1.2	5.3	16.5	12.7
(b) High dry matter (1 variety)	21.0	11.1	32.1	4.0	1.5	5.5	19.1	13.2
3. Sugar beet (3 varieties)	19.7	10.3	30.0	4.1	1.4	5.5	20.6	13.9



BEETS ARE VALUABLE FODDER FOR STOCK

TABLE 2—A COMPARISON OF SUGAR AND FODDER BEETS AND MANGOLDS IN NEW ZEALAND
(From observations made on trials in 1953-54)

Variety	No. of samples	Proportion of root above ground	Ease of pulling	General root shape	Skin colour	Flesh colour	Dry matter in roots (average of 5 trials) Per cent.
Sugar beets							
Klein	1	Practically none	Very hard	Long tapering, fangy	Green above ground, white below	White	23.9
Hinderupgaard	1	One-fourth to one-third	Fairly hard	Tapering	Green above ground, white below	White (very hard)	22.0
Hunsballe ..	2	(a) about one-fourth	Hard	Long tapering	Green above ground, white below	White	21.9
		(b) about one-third	Medium-hard	Tapering to tankard	Green above ground, white below	White	20.6
Fodder Beets							
Pajbjerg Rex .	3	About one-third	Fairly easy	Tapering to long globe	Green above ground, white below	White	19.3
Korsroe ..	1	About one-half	Easy	Tapering to tankard	Yellow to green above ground, orange to white below	Greenish or yellowish white	16.9
Red Otofte ..	2	One-half or more	Easy	Tapering to tankard	Red above and below ground	White, red rings	16.7
Yellow Daeno	2	About one-half	Easy	Long tankard	Yellow-green above ground, orange to yellow below	White	15.8
Mangold							
Yellow Globe .	1	Mostly above ground	Very easy	Globe	Yellow above ground, white below	White	9.9

All seed was from imported lots except: (a) Klein sugar beet, a locally made selection from Kleinwanzleben (a variety used for sugar production); (b) Korsroe fodder beet—locally grown seed; (c) Yellow Globe mangold—locally grown seed.

crease to a point which will cause the death of stock fed on them. Common varieties of mangolds include Yellow Globe, Orange Globe, and Long Red.

(b) **Sugar beet** (*B. vulgaris* var. *saccharifera*): The roots grow almost entirely under the ground, usually not more than one-fourth exposed, and have a dry matter content generally above 20 per cent. They are usually tapering, and carry a certain amount of soil in the side rooting system.

Sugar beet can be fed to stock directly after being pulled and the tops provide additional feed of good quality. Varieties grown in New Zealand which come into this group include Klein (a locally made selection from Kleinwanzleben), Hinderupgaard, and Hunsballe.

(c) **Fodder beet:** Fodder beet varieties appear to have originated from crosses between mangolds and sugar beets and are intermediate in form between the parent types. Like sugar beets they can be fed to stock immediately after being pulled, and the tops also provide valuable fodder. The varieties of fodder beet available today have a considerable range of dry matter content, but are all really intermediate between sugar beet and mangolds in this respect.

Those varieties of higher dry matter content also tend to resemble sugar beets in other characteristics rather more than do those of lower dry matter content.

Pajbjerg Rex is a fodder beet of high dry matter content (not to be confused with Pajbjerg, a sugar beet variety). Varieties of fodder beet of lower dry matter content include Korsroe (also known as Svea-Rex in Sweden), Red Otofte, and Yellow Daeno.

Table 1, assembled from information published by the Commonwealth Bureau of Pastures and Field Crops, gives the results of some Danish trials; Table 2 summarises the results of trials carried out in several parts of New Zealand during the 1953-54 season.

Radio Broadcasts to Farmers

RADIO broadcasts to farmers will be given during October as follows:—

1XH Hamilton

10 October (12.33 p.m.)—"Grass Staggers in Kun Cattle", by D. W. Caldwell, Veterinarian, Department of Agriculture, Hamilton.

17 October (12.33 p.m.)—"Supplementary Crops", by H. McM. Bull, Instructor in Agriculture, Department of Agriculture, Hamilton.

28 October (8.10 p.m.)—"Current Farming Problems", by a panel of speakers.

31 October (12.33 p.m.)—Talk, "Pasture Irrigation".

1YZ Rotorua, 7.15 p.m.

13 October—"Seasonal Work on the Average Pumice Land Farm", by C. R. Taylor, Fields Instructor, Department of Agriculture, Rotorua.

27 October—Young Farmers' Club talk, organised by the Rotorua district committee of the Federation of Young Farmers' Clubs.

2XA Wanganui, 8 p.m.

6 October—"For the Country Woman", by Mary MacDonald.

13 October—"The Radio Vet.", by S. Jamieson, Veterinarian, Department of Agriculture, Wanganui.

20 October—"Meat Grading for Local Consumption", by W. F. Sears, Meat Inspector, Department of Agriculture, Wanganui.

27 October—"Fodder Beet for Supplementary Feed", by A. K. Booth, Instructor in Agriculture, Department of Agriculture, Wanganui.

3YA Christchurch, 12.20 p.m.

3 October—"Farm Management Survey of Akaroa County", by R. C. Stuart, Field Economist, Department of Agriculture, Christchurch.

Regular Sessions

1XH Hamilton, Mondays at 12.33 p.m. and Tuesdays at 8 p.m. (Frankton stock market report), Wednesdays at 12.33 p.m. (report from Ruakura Animal Research Station), Thursdays at 12.33 p.m., Fridays at 8 p.m. (stock sale review).

1XN Whangarei, Mondays at 8.5 p.m., Wednesdays at 8.1 p.m. (Northland stock market report), Fridays at 8.1 p.m.

1YZ Rotorua, Mondays at 12.33 p.m. (Waikato stock market review), Tuesdays at 7 p.m. (Hamilton stock market report), Wednesdays at 7.15 p.m. (Pig Council talk on fourth Wednesday of every other month), Thursdays at 12.33 p.m. and 7.15 p.m. (fortnightly).

2XA Wanganui, Wednesdays at 8 p.m. (Wanganui stock sale report), Thursdays at 8 p.m.

2XG Gisborne, Tuesdays at 8 p.m., Fridays at 8.2 p.m. (Gisborne stock market report).

2XN Nelson, Thursdays at 8 p.m.

2XP New Plymouth, Thursdays at 8.1 p.m.

2YA Wellington, Mondays at 7.15 p.m., Thursdays at 12.33 p.m., Fridays at 7 p.m. (Feilding stock market report).

2YZ Napier, Tuesdays at 12.12 p.m. (Hawkes Bay orchardist session), Tuesdays at 7.10 p.m., Wednesdays at 7.15 p.m. (Hawkes Bay-Poverty Bay livestock market report), Thursdays at 12.33 p.m.

2ZA Palmerston North, Mondays at 12.33 p.m., Fridays at 8.45 p.m. (Feilding stock market report).

3XC Timaru, Mondays at 8 p.m. (Pleasant Point stock market report), Tuesdays (fortnightly) at 8 p.m. (Temuka stock market report), Wednesdays at 8 p.m., and Saturdays at 10.30 a.m.

3YA Christchurch, Mondays at 12.20 p.m., Wednesdays at 7.15 p.m. (Addington stock market report), Thursdays at 12.33 p.m. and 7.15 p.m.

3YZ Greymouth, Thursdays at 12.33 p.m.

4YA Dunedin, Mondays at 12.33 p.m., Wednesdays at 7 p.m. (Burnside stock market report), Thursdays at 12.33 p.m.

4YZ Invercargill, Mondays at 12.33 p.m., Tuesdays at 7 p.m.

Wool Shed Design and Construction

FURTHER basic features of what might be described as the standard type of wool shed are discussed here by J. E. Duncan, Wool Supervisor, Department of Agriculture, Wellington. This is the second and concluding part of an article on wool shed design and construction which was begun in last month's "Journal".

PLANS of 2-, 3-, and 4-stand sheds were included in the first section of the article.

Wool Room and Accessories

The first consideration in the layout of the wool room is that it should be as close to the shearers as possible to minimise unnecessary walking and to maintain the follow-through principle; that is, the wool comes off the sheep and travels via the wool table and the bins to the press by the shortest practical route and with the least handling.

The size of this room will depend on the amount of wool passing through it and the amount of storage space required for full bales. When calculating the latter allow 4½ft. x 2½ft. x 2½ft. for each bale. This measurement allows for the bulges on both ends and sides. In most modern sheds bales cannot be stacked more than three tiers high, though in some of the large, old-fashioned sheds 4 or even 5 tiers were usual. When head room is being considered the type of wool press to be used must be taken into account, and there must be sufficient room for the top box either under or between the rafters.

Above all, the area provided for the wool room should not be skimped, because cramped conditions usually lead to bad workmanship and any small initial saving is likely to be cancelled out annually by poor or inadequate preparation of the clip. A good-sized wool room will also enable more sheep to be held below the floor.

Good light in the wool room is just as necessary as on the shearing board and provision should be made for this. All timber and other materials in this room should be smooth so that wool will not catch on them and this applies particularly to the wool bins.

The number of bins required will depend on the size of the clip and how intensively it is to be prepared; that is, whether a classer is to be employed or whether all or most of the preparation is to be done by the broker. Folding bins have been shown in the plans because these allow the maximum space in the wool room for storage of other goods in the off season. It is all very well to preach a counsel of perfection and say that the wool room should not be used for other purposes, but on most farms it is used throughout the year as a general store room. From the point of view of a return on

Below—Wool room with plenty of space and head-room.

Get **WEEDONE** on to those Buttercup fields
and you're bound to get bigger

Butterfat yields !

CREEPING AND CELERY-LEAVED BUTTERCUP MEANS QUICK-SPREADING TROUBLE! COUNTER-ATTACK WITH WEEDONE FOR A QUICKER, SURER KILL!

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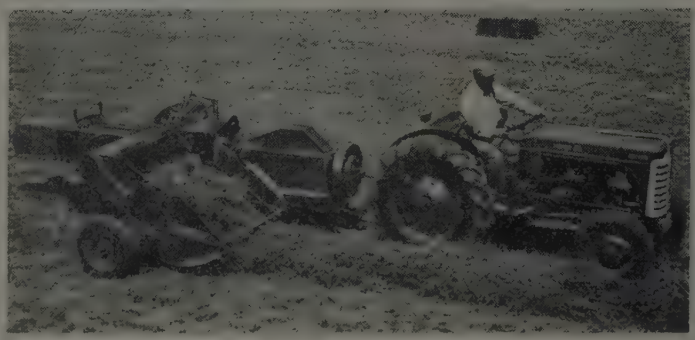

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capital invested this is all to the good, provided it is well cleaned out before it is wanted for handling wool. Bits of string, a sprinkling of chaff, and a dusting of fertiliser do not enhance the value of the wool.

The bins can be placed as shown on the plans or the arrangement altered to suit individual requirements. The material used for building bins varies considerably. Solid dressed timber, three-ply, hardboard, chain-mesh netting, and even asbestos cement sheeting or corrugated iron have been used successfully. Some wool shed owners have constructed movable bins on castors similar to those used in wool stores. These work very well, provided there is sufficient space to park them when they are not in use. They have the great advantage that they can be placed exactly where they are wanted—near the wool table while they are being filled and alongside the press when they are being emptied.

Whatever the style or design each bin should be capable of holding a minimum of about a bale and a quarter to a bale and half of wool. Some bins may be designed much larger than this. The shape will vary, but the minimum volume is about 100 cub. ft. A common size which fulfils these requirements is 6ft. 3in. x 4ft. x 4ft. Sometimes the preferred shape is narrower and deeper, which holds the wool more securely, but the bin will be darker and the operator will have further to reach.

Another arrangement for holding belly wool is what might be described as a large horizontal bin built in the form of a ceiling above the catching pens with low sides to it. The fleeco throws the bellies up into it direct from the board. At intervals they are pushed over the end into the wool room, **not** directly into the press as is sometimes done. For best results bellies require picking over and the removal of the stained portions.

Folding bins (left, in position; right, folded back). Use of such bins is a popular method of gaining extra space after shearing when storage room for materials other than wool is required.

Some sort of permanent arrangement for holding fadges similar to those illustrated is very desirable. Sundry contraptions of wire and string are common but not good enough for the job they have to do.

In the writer's experience the wool tables found in most of the older sheds are not completely satisfactory. The wool table is a very important item and careful attention should be given to it if good results are expected. Among the common faults are tables placed or hinged against walls with one side inaccessible, tables too short or too narrow, inadequate or incorrectly spaced slats, and poor lighting.

A good size for a wool table is 9ft. x 4ft. x 3ft. high. A table of this sort can be made with folding legs if desired so that it can be stored in a small space. The slats or battens forming the table top are usually about 1in. wide and 1½in. deep with rounded tops. They may run either lengthways or crossways without any appreciable difference in efficiency. Roller-top tables do not seem to be much advantage.

Left—Movable wool bins for fleeces are a great convenience in large sheds, because they can be placed exactly where required. Right—Three movable bins placed conveniently within reach of the wool table. There is plenty of room all round the table.

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Theoretically the rollers turn and keep clean, but in practice the ends usually get clogged and the rollers soon become just as immobile as slats. Spacing of the slats varies, but it is usual to have them not less than 1in. apart. A sheet of hardboard makes an ideal cover for the table top when lambs' wool is being handled. There should be 6in. boards **inside** the legs round the bottom of the table. These boards will keep the locks in their place and still leave toe room.

Grinder and Engine Rooms

A very common arrangement in New Zealand sheds is to have one room perform the three functions of engine room, grinder room, and workshop. There is nothing wrong with this arrangement provided that grinding can be done efficiently with adequate light and no interference from lack of space or fumes, oil, water, etc. Too often the engine room tends to be dark, cramped, and untidy, and leakage of exhaust fumes can make it unhealthy or even dangerous. Storing large quantities of petrol and oil in the engine room will also create a hazard and is likely to render void any fire insurance policy on the shed.

In some instances the engine room is built as a lean-to with its floor on ground level and a large door or doors to allow a portable engine to be moved in and out as required. More frequently the engine is mounted on a permanent concrete foundation block and provision is sometimes made for taking a belt out through an opening in the wall to drive a circular saw. In layouts of this type the floor is often on two levels with the upper one, where the grinder is mounted, as a continuation of the board or wool room floor.

A wool table against a wall reduces speed and efficiency of skirting.

The grinder room should be supplied with sufficient shelves and cupboards for all equipment and if, as is usual, there is a workbench, adequate provision should be made for storing tools; for example, a shadow board behind the bench where every item has its place clearly marked. Belts and the exposed edges of grinder discs must be provided with adequate guards. Some of the modern electric grinders are so well balanced that they do not require bolting down to a heavy foundation block as used to be standard practice; they can even be mounted on a heavy wooden trolly and wheeled from one position to another as required.

Other Internal Details

Other internal details are:—

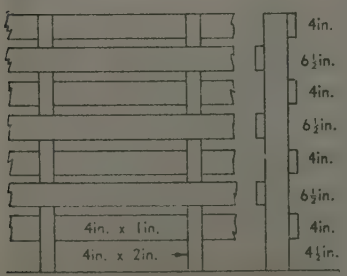
Pen Divisions

The height of internal divisions between pens varies considerably

Folding frames (left) for holding fadges are convenient, but some prefer a more robust fixture (middle). Others prefer movable skips such as that at right for handling oddments.

This grinder is handy to the board and well lighted at both discs.

between sheds according to the preferences of owners. From 3ft. 2in. up to 4ft. can be found. Unless the sheep are Merinos or Cheviots, 3ft. 4in. is usually sufficient. The diagram below illustrates a good method of attaching rails in staggered arrangement on opposite sides of the uprights, which economises in timber and also prevents bruising of the sheep. Similar rails should be provided round the walls to keep sheep from being bruised against the studs.



Method of staggering rails on opposite sides of uprights in sheep pens to prevent bruising of sheep.

Gates and Doors

Various types of gates are in use in sheds, including the common varieties swing, lift-up, slide-back, and tip-up and some less well-known hybrids such as the lift-swing type.

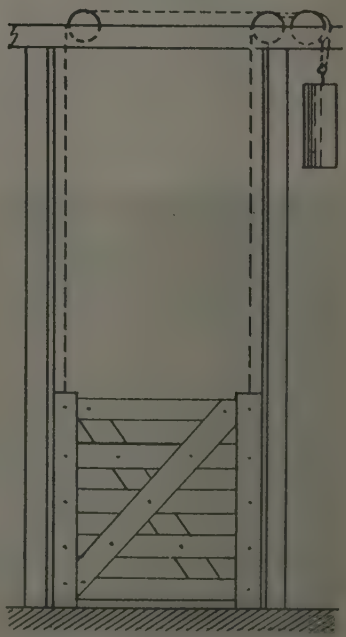
The swing gate has obvious limitations in a wool shed, as it may be difficult to open against a crowded pen of sheep. The lift or slide-up type is generally the most popular and satisfactory. An example is shown in the diagram at right and it will be noted that both ropes are attached to a single counterbalance weight. This ensures that the gate lifts straight up without any tendency to move sideways and jam. It is easy and quick to work, least likely to be jammed by pressure of sheep against it, and does not even need to be fastened unless it is to be left for a good length of time. Its only drawbacks are expense and the headroom it requires.

Slide-back gates are not so common and have some disadvantages. Unless well constructed they do not work easily and readily get out of order or even broken by pressure. To work well a gate of this type must slide into a recess in the pen where it is protected from pressure and run on wheels on a steel rail above and in a channel guide below. If the supporting rail is omitted, the gate is much more vulnerable.

Tip-up gates are laborious to use and tend to get broken easily, being pivoted on one corner only.

The lift-swing gate (which was described on page 202 of the February 1955 issue of "The New Zealand Journal of Agriculture") has certain advantages to commend it, though it is more complicated and therefore more expensive to build than a plain swing gate. As its name indicates it can be both lifted (it has a counterbalance) and swung. It therefore has the advantages of both types and can be used as a sweep to force sheep forward.

Gates between pens should normally be in the corners and the number provided is a matter of economy versus convenience. It will be seen that the 4-stand shed plan has been liberally provided with gates, including a small one between the right-hand catching pen and the larger pen alongside it. This will be found useful for a variety of purposes. The dotted line just inside the entrance ramp represents a light lift gate which will hold sheep in while the sliding doors are open but will still allow plenty of ventilation on hot nights. Used in conjunction with the two other gates this light gate makes



Method of counterbalancing a lift gate. Both ropes are attached to the same weight.

a handy small pen for a variety of purposes. The door shown in the right-hand bottom corner is intended for loading out sheep and lambs direct on to a truck..

The door at the end of the board alongside the wool table is an added convenience as an alternative entrance and a quick access to the counting-out pens. The position of the ramp up from below the shed is shown with its hinged trapdoor cover. With this arrangement it is necessary to have the small door shown between wool room and night pens, which in addition is very useful for access in this part of the shed when the ramp and trapdoor are not in use. Sliding doors are the popular choice for the main entrances, as they can be opened to any extent required, will remain there, are not affected by the wind, and need no room to swing.

Catching Pens

The size and shape of the catching pens in a multi-stand shed are necessarily a compromise. The width is related to the spacing between stands, so that usually it cannot much exceed 6ft. This means that if the pens are to hold a reasonable number of sheep, they should be fairly deep. Shearers, however, do not like deep pens, as it means further to go to catch their sheep; 10ft. is too deep, and a pen 6ft. square is too small, so in the plans a depth of 8ft. has been recommended. These pens should hold 15 to 20 sheep according to size of the animals. The fronts of the pens next to the board should be as high as practicable consistent with good light in the pens. They can be 5ft. high and still allow a shearer to see over if there are skylights to light the pens. The aim is to avoid continually frightening the sheep by the traffic on the board so that they huddle at the back of the pens most of the time.

The large shed of Mr. L. Harris, "Brooklands", Hawkes Bay, incorporates the novel feature of an internal drafting race.

Lighting

It is not an exaggeration to say that lighting can make or mar a shed, for it is well known to all who have studied it that good lighting is absolutely essential for fast, accurate, intensive work. Both shearing and wool handling come into this category. The greatest single improvement that could

Left—Counter-balanced lift gates are the most popular type in modern wool sheds. Right—Tip-up gates save space, but are more laborious to use.

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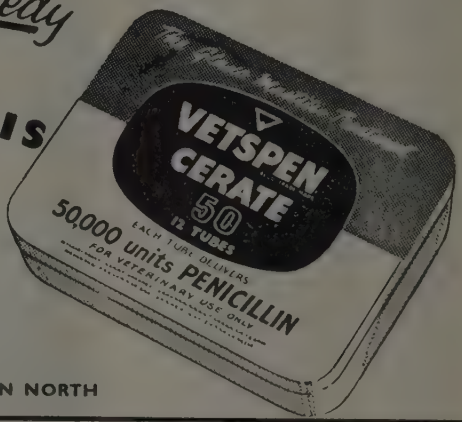

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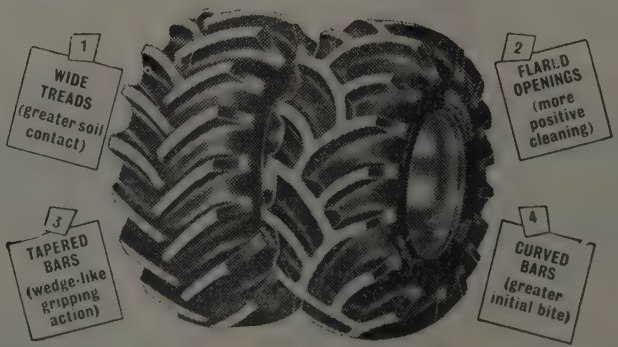

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be made to many old sheds would be to improve the lighting, and in many sheds this would not be very difficult or expensive. The first step would be to paint the inside of the wool room and board a light colour. One of the modern quick-drying and washable plastic finishes would be excellent. White gives the most efficient light reflection, but if this is found too trying on the eyes, it can be softened to one of the pastel tints; a very pale blue is used in some of the big wool stores.

The second step is to provide skylights. Area for area these are more efficient and let in more light than windows. The modern corrugated transparent plastic sheets are easy to fit and leak free in contrast to some of the older types, which gave a lot of trouble. They are also virtually unbreakable. A few skylights at strategic positions will make a world of difference. In the plans one skylight has been provided in the wool room and one over the back of the pens to light this area and draw sheep in toward it. Where adequate light for the grinder (it must be good for both discs) cannot be provided by windows a skylight is usually the answer.

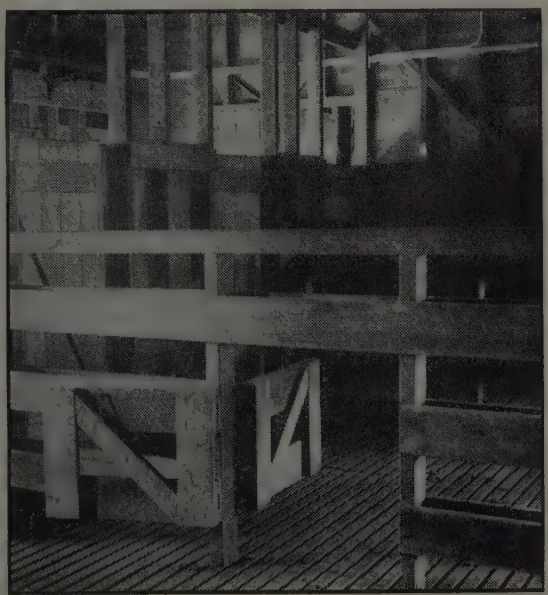
The only point that requires watching is that direct sunlight does not strike down on the wool table or on the shearers. In the former case it will alter the appearance of the wool and probably cause it to be classed wrongly; in the latter it will be likely to lead to an overheated situation in more ways than one. Where necessary a light calico blind on a spring roller can be rigged to pull across below the skylight by a long cord.

A high narrow window will admit more light than a low wide one of the same area, because with the high window the width of the sill cuts off proportionately less of the oblique light rays. For the same reason a few large windows are better than a larger number of small ones of the same total area. Some of the available light will also be cut off if the windows are abnormally high up in the walls and the eaves of the building project considerably.

One place where good light is **not** wanted is shining up between the floor battens. This will frighten the sheep and make them very difficult to get into the shed. On the plans the battens run crossways for this reason. Generally sheep will draw into the shed best if they are moving from a darker entrance toward a lighter area. The latter is provided in the plans by the skylight at the back of the pens, and an electric light just below this skylight will serve the same purpose at night. The end of the shed where the sheep enter can be darkened if necessary by blinds over the appropriate windows.

Most sheds being built today make provision for electric light and some owners have even installed fluorescent lights. These are excellent in the wool room for dull days if they are of the

Simple precaution for preventing a lift gate from being pushed up accidentally by sheep; one of the guides is cut as shown to act as a stop.



Above—A small gate between catching pens is convenient. At right—This catching pen has a ceiling, which provides storage space above it. Belly wool can be thrown up here out of the way until it can be picked over and pressed.

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correct daylight type. One large wool store in Sydney has no windows on the lower floor and is lit entirely by fluorescent lights, which have proved eminently satisfactory. Light on the board and in the grinder and engine rooms will also be an asset on dull days and early in the morning, particularly at crutching, when the days are short.

This shed derives more of its light from skylights than from windows. The former are more effective.

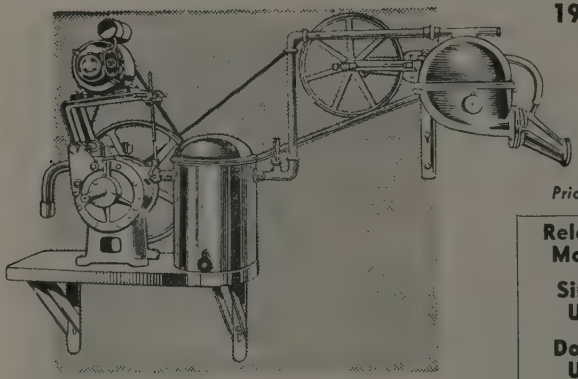
Ventilation

Like lighting, ventilation in many sheds could be improved, often without very much trouble. Hot air rises, so one of the easiest and most effective ways of providing sufficient ventilation is to provide a large louvre at each end of the shed high up in the gable. Usually these louvres are of wooden slats, like a venetian blind, to keep out rain but allowing free flow of air. This arrangement gives a through current of air under the roof, which continually carries away the stale, moist air rising from the close-packed sheep in the night pens. This flow of air will minimise or eliminate the trouble with condensation and drip from an iron roof which has not been sarked.

Louvres can also be provided along the sides of the shed just below the eaves. With a wooden building this is easily accomplished, either by omitting the top weatherboard or by having it hinged in sections so that it can be opened as required. It will be found worth while to cover all ventilation openings on the inside with wire netting to keep out birds, which can be troublesome and make a lot of mess at times.

A light hurdle or a permanent light gate can be placed inside the main door to allow this to be left open on very hot nights. This can easily be added to existing sheds. In the plans the double pen gates will also serve a similar purpose if the loss of the small triangle of space is not begrudged. Another obvious source of added ventilation is to leave all port hole and other doors open and hooked back.

Left—This shed has good lighting at night (from fluorescent fixtures) as well as by day. Right—Corrugated transparent plastic sheets are effective, easy to install, leakproof, and practically unbreakable.



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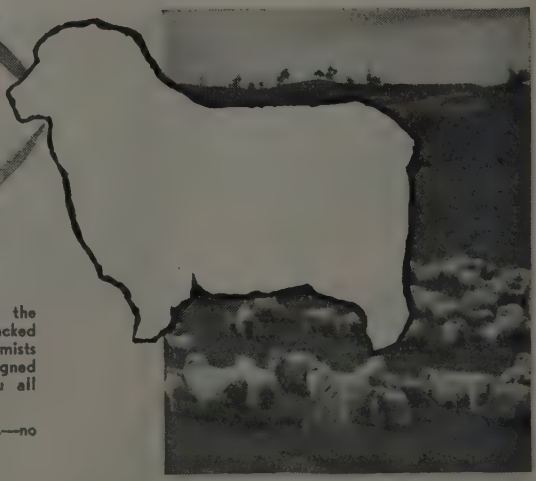

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The modern type of adjustable louvred glass window is proving very popular for new wool sheds and will be found to supply all the ventilation required if used with openings in the gables to carry away hot air. A feature of these windows is easy and quick adjustment to suit all conditions.

A clear distinction must be made between a well-ventilated and a draughty shed. Draughts usually come up through the grating floor and the obvious remedy is to prevent strong prevailing winds from blowing under the shed. This can be done either by temporary or permanent means; for example, by arranging sacks or sheets of iron—an untidy expedient at best—or by having the outer sheathing of the shed extending to the ground. One Canterbury farmer has gone to considerable trouble to provide hinged and adjustable swinging panels below the shed to stop wind from blowing under it.

This shed has adequate ventilation, both in the gables and from the cowls on the roof. At the same time draughts can be prevented by enclosing the basement.

Foundations

The amount of excavation required, if any, will depend on the individual shed. Piles are nearly always of reinforced concrete, which are usually dearer than timber in first cost but cheaper in the long run because they are practically everlasting. Spacing of these piles will depend on the load to be carried and to some extent on the cross-section of the sleepers and joists to be used. Where the shed is built on soil of poor load-bearing capacity, such as some types of pumice, the piles will have to go well down and have a generous foot at the bottom. This is usually achieved by enlarging the bottom of the hole and casting each pile in situ.

The owner of this shed (Mr. W. B. Trotter, Fairlie) has gone to considerable trouble to provide large, adjustable flaps (which give complete regulation of air flow under the shed) in conjunction with a generous, protected opening along the ridge of the roof.

A common size of pile is 8in. square, but under the part of the shed where sheep are to be run the sharp corners should be removed. A method which has been used successfully is to have glazed earthenware pipes as boxing and to cast the piles inside these. The pipes remain permanently in position and give a good, smooth, clean surface.

A shed high off the ground can be very draughty in windy localities unless most of the basement is enclosed.

The spacing and size of the floor members will vary according to the

These foundations give plenty of head-room below the shed, but the basement is not suitable for holding sheep continuously or regularly, owing to lack of floor battens and subdivision.

loading and to the dimensions of timber used.

Under the main part of the shed, where the live load is similar to that in an ordinary house and should not exceed 40lb. per square foot, the 8in. x 8in. piles should be 4ft. 6in. apart on centres and capped by a 4in. x 3in. sleeper plate on edge. A common size for floor joists is 5in. x 2in. and such timber will span up to 7ft. at a loading of 40lb. per square foot; that is, the rows of piles can be 7ft. apart. The joists themselves are on 18in. centres. If 4in. x 2in. joists were used, the span could be only 5ft. 6in.

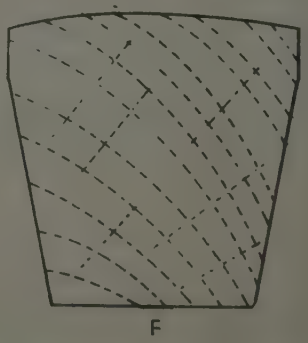
The floor loading in the wool room where bales of wool are stored will be much heavier—up to 120lb. per square foot. Under this floor the 8in. x 8in. piles will have to be only 2ft. 3in. apart on centres, again capped by a 4in. x 3in. sleeper plate on edge. The floor joists will again be 18in. apart on centres, but they will have to be much heavier. The following are some examples of sizes for various spans:—

Size of joist	Maximum span
6in. x 2in.	4ft.
7in. x 2in.	4ft. 9in.
8in. x 2in.	5ft. 3in.
9in. x 2in.	6ft.
10in. x 2in.	6ft. 9in.

Floor

The undesirability of having hardwood floors for the board and wool room because of trouble with a slippery surface and splinters has already been mentioned. Pine, preferably pressure treated, is often used for this purpose nowadays. This timber is not really good enough, however, for the battens in the sheep pens; something harder and stronger is required to stand up to the constant wear and tear. Rimu or matai is a better choice if available. Pressure-treated tawa is also proving useful, but if not pressure treated is very subject to borer. It is a strong, tough timber. Pressure treatment of timber in commercial plants is now becoming very popular and will make soft sap timber equal to or better than heart native timber for durability. Through necessity, as supplies of good native timbers are depleted, treatment of exotic and also sap native timber must increase. At present there appears to be no alternative in sight, and it is likely that there will soon be much less prejudice against treatment.

It should be well enough known by now that floor battens require an adequate bevel on one side or preferably both sides if they are to keep clean. Those who have tried it consider it worth the extra expense to have all the battens run through a shaping machine, which ensures that they are smooth, straight, and uniform



Shaping of floor battens. A—The most primitive type of square battens, which quickly block up. B—An improvement on A. It is a cheap type of batten made by ripping down a 4in. x 2in. piece of timber to produce two battens. However, this provides relief on only one side. C—Another improvement on A, which is made by relieving both sides and which allows everything to fall clear. D—Dimensions of a good type of batten. E—If too much is taken off the corners of the battens, they wear round on top, block easily, and make the sheep very restless. F—Tracing from the end of a good type of machine-dressed batten.

Left—Louvre windows give good ventilation over the board in this shed. The port exits are permanently protected against wind and rain. Right—The lower parts of these windows serve as effective and easily regulated ventilators.

and enables them to be evenly spaced and laid to form a first-class floor. The smooth surface reduces the tendency of dung to adhere. The spacing is important, for if it is too narrow, the floor will never remain clean for long and if it is too wide, the sheep will be very restless. The author has found from experience and from measurements in many sheds that §in. is the best distance between battens.

Normally these battens run across the shed so that sheep see a minimum of light coming up between them, and where they are bevelled on one side only the straight, unbevelled side should face the incoming sheep for the same reason. If battens run in this direction, they will run lengthways in the catching pens, which is the usual arrangement. Some shearers, however, prefer them to run the other way in the catching pens (parallel to the board), as they claim that this gives them and the sheep a better foothold for "walking" the sheep back out of the pen.

There are some sheds where the battens run lengthways at the back of the pen and crossways in the front section near the door. In others farmers have gone to the trouble of putting in a sloping floor in the catching pens (3in. higher at the back than at the front) so that sheep are being pulled out downhill. They claim that this is a real labour saver, but it is for the individual builder to decide how far he will go in adopting any of these features. Irrespective of their direction the ends of all battens should be drilled before being nailed to prevent splitting. If heart matai battens are used, holes should be drilled for **all** nails.

A small but important point concerns the floor around the grinder. If this is concrete, it should be covered with some old mats or sacks to prevent breaking of combs and cutters accidentally dropped.

Skeleton of the Shed

It is not intended here to deal at length with the erection of the shed, but merely to mention some salient points that have to be watched in the design.

Studs

The stud height is important; if it is too low, the shed will be hotter and harder to ventilate than normal and if it is excessively low, it will also interfere with the erection of the shearing plant. Normally the minimum stud height to give reasonable clearance above the machines is 8ft. 6in., but 9ft. is better. A stud higher than this will give a cooler shed, but will add to expense all round.

Support for Machines

In Australian sheds it is common for the shearing plant to be supported on the usual 10in. x 4in. beam but with this attached to heavy posts sunk deep in the ground and independent of the frame of the shed. In New Zealand sheds the beam is often bolted direct to the studs of the shed. If these warp or the whole shed settles, the shafting is very liable to be thrown out of line, causing unnecessary friction and wear and tear. Any vibration is also transmitted to the walls and causes extra noise. If the Australian system of independent posts is not adopted, at least the studs carrying the 10in. x 4in. beam should be heavier than normal and the piles below them should go deeper with a bigger foot for extra support to minimise settling.

Spacing of studs (distance from centre to centre) will vary with individual builders and according to the type of external sheathing to be used. This will also determine whether dwangs between the studs are needed and the spacing and number of rows. Wind braces running diagonally are also needed, at least at each corner, to stiffen the shed. These are often of 6in. x 1in. timber, but as an alternative flat steel strips about 2in. to 2½in. wide and ⅛in. thick can be used. They take up little room and are easily checked into the studs, but every nail hole has to be drilled.

External Details

The following materials have all been used for building wool sheds in New Zealand at one time or another: Rammed earth, stone, brick, solid concrete (both with and without reinforcing), concrete blocks (solid or hollow), steel frames covered with galvanised iron, wood frames covered with weatherboards, vertical boards, asbestos cement sheets or shingles, plain or corrugated black or galvanised iron or aluminium, and other less common materials. The material of choice will depend on so many local and other conditions that there is no

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point in considering it further, but some general observations on the exterior of the shed are pertinent.

Dark-coloured buildings tend to be hotter than lighter-coloured ones. The two extremes are an iron shed and roof painted with tar or black bituminous paint and an unpainted aluminium shed and roof. The former will be unbearably hot in midsummer; the latter will reflect so much of the sun's heat that even the roof will be only slightly warm. They will both, however, suffer from the drawback of being cold at night with consequent liability to condensation and drip. In some districts this is so bad that all sheds with metal roofs require sarking with tarred paper or other material under the iron or aluminium. Wooden sheds treated with creosote also tend to be hotter than those painted with light-coloured paint. White paint is best in this respect, but may not weather well, particularly in coastal districts.

Usually it does not pay to make windows on the site. Unless they are of some special type, it is cheaper and usually quicker to order them from a joinery factory. Doors are another matter, as the type required in a shed can usually be made on the spot cheaper and quicker than they can be made to order.

White or other light-coloured paint reflects heat and helps to keep the shed cool.

The loading platform should have a good, solid buffer beam along the front at the right level to take the abuse it is designed to withstand. If the deck of the platform finishes above the level of the average motor truck, this is an advantage in loading.

A dual-purpose platform. It can be used for loading out from the shed or for getting sheep into it, when hurdles are fitted temporarily into the sockets bolted to the concrete.

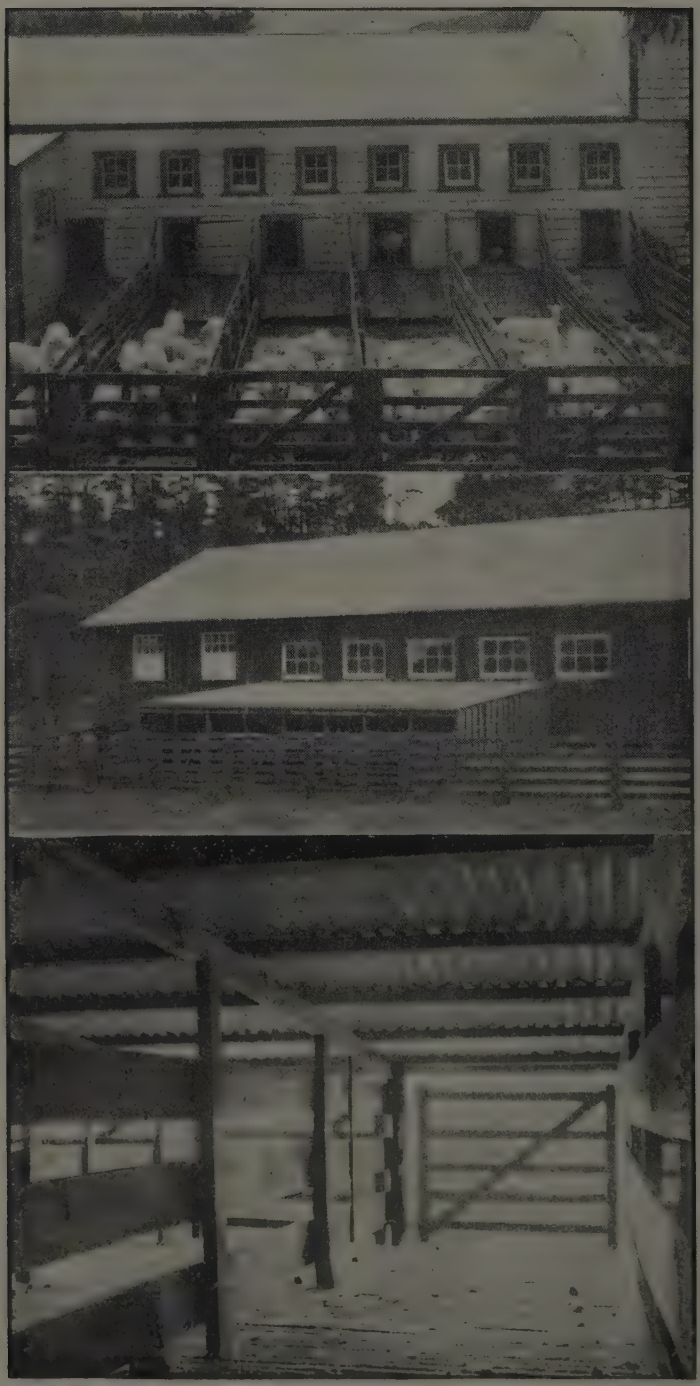
Before the shed is built consideration should be given to installing a large concrete water reservoir for collecting water from the roof. Where the levels are right this tank can be completely underground out of the way and still serve the dip, etc.

The ramp leading up to the main entrance should not be unduly steep, but if this is unavoidable for any special reason, every third or fourth batten should be raised above the others to give a better footing.

Roof

It is not necessary to go into much detail about the roof because in small sheds construction is fairly straightforward, and in large sheds requiring special trusses for wide spans the farmer should consult a competent builder or architect. In the older sheds there was sometimes a loft under the roof for storage and this was a very useful feature which also resulted in a cooler building. Nowadays, in the interests of economy, roofs are usually lower pitched and there is not room for much storage space.

With galvanised iron or aluminium roofs a method which has been used successfully is to omit the cover boards along the edges of the gables, roll the last corrugation round to form a tubular edge to the end sheet, and allow this to project just beyond the barge board. This forms a neat finish to the roof and does away with the frequent



replacement of the cover boards, which are usually the first part of the woodwork to rot.

Counting-out Pens

In the plans of sheds provision has been made for roofing over the counting-out pens. This is another cheap way of increasing the night-pen capacity of the shed, but provision must be made for lift-up gratings in these pens similar to those provided in the night pens under the shed. It is also wise to have these gratings resting on concrete floors so that the whole area can be thoroughly cleaned periodically. In an outbreak of blood poisoning disinfection of the shearing board and the counting-out pens, the two portions of the shed which come in contact with cut sheep, is most important.

← The most common type of counting-out pen.

Generally the roof over the counting-out pens can be kept low enough not to obscure the windows on the shearing board. However, if this cannot be avoided, good lighting can still be secured on the board by skylights and/or the use of a continuous strip of glass or transparent plastic high up in the wall above the board. One of the most evenly lighted boards the author has seen was lighted in this manner with short lengths of corrugated plastic (off-cuts from skylights) forming a continuous strip all along above the board.

← The low roof of these counting-out pens does not interfere with the windows in the shed.

The width of counting-out pens is usually similar to that of catching pens. The length will depend on the number of sheep they are expected to hold. Usually this length is not less that 15ft., which with a width of 5ft. should accommodate 25 sheep tightly packed. If Mr. G. Bowen's shearing technique is widely adopted, future builders will have to think about making the pens longer. The plans given in the section of this article in last month's "Journal" also show a covered alley-way down the side of the last pen leading to a gate below the shed. This alley-way allows sheep in wet weather to be taken in a complete circle if necessary (under the shed and up the ramp again) under cover.

← These covered counting-out pens are provided with properly battened floors so that they can be used as additional, emergency night-pen space.

Flushing Ewes in South Auckland

By J. E. BELL,

Fields Superintendent, Department of Agriculture, Auckland

LAMBING percentages obtained in flocks in South Auckland point to a weakness in management about tupping time. The fat lamb farmer is generally quite satisfied with a lambing percentage of 100 and the hill country farmer is content with much less. The fat lamb farmer generally buys in full-mouthed ewes, mainly from the east coast but including considerable numbers from the King Country and Raglan County. He keeps these about 2 years before replacement. With the adequate and close attention that can be given to small flocks of 50 or 100 ewes these are capable of producing a lambing percentage of 150 or more, and with large flocks percentages of 120 should be fairly readily attained.

THE hill country farmer has a considerable percentage of 2-tooths in his flock, and owing to the low carrying capacity and the general poor quality of the feed available on the hills a high lambing percentage cannot be attained. However, with the improved pastures from aerial topdressing and the closer subdivision now being provided the lambing percentage on hill country should increase considerably.

Little Cropping

It is estimated that 97 per cent. of the farmed areas of South Auckland are in pasture and few or no crops are provided for flushing ewes. Except in districts such as Taumarunui, Waihi, and Tokoroa, the weather in January and February is often dry and the pastures are not in the best order for provision of flushing feed. If there is fear of facial eczema and sheep farmers follow the advice of the Department of Agriculture in regard to concentrating their stock on small areas, the diet of the ewes at the pretupping and tupping period may be drastically reduced. This happened this year and in 1954, with no doubt material effect on the lambing percentage in the following spring.

Management on Fat Lamb Farms

On fat lamb farms the lambs are to a large extent sold fat off the mothers and the remainder after weaning are placed on the best feed available, and the ewes are kept on short commons because they are inclined to become too fat at this period. Their grazing is usually restricted to a few of the poorer fields on the farm. If the weather is very dry, there is difficulty in finishing off the weaned lambs and keeping cattle in good condition and these consume all the fresh feed that is available, leaving none or very little for flushing the ewes. If the weather is not so dry, feed is available for flushing the ewes and a better lambing percentage can be expected.

A few farmers do provide flushing feed by sowing in spring temporary pasture or crops such as chou moellier, soft (white-fleshed) turnips, and rape, part of which can be used for finishing off the tail-end lambs and the remainder for flushing ewes. In a dry season this pays well, but in a reasonably moist summer permanent pastures will provide the needs of both ewes and lambs. If these moist summers were less frequent, no doubt the provision of crops for lambs and flushing would be practised as much as it is in Canterbury and similar dry areas.

However, there is much room on many farms in South Auckland for pasture improvement by renewal of poor soles of grass by use of the plough. On these farms summer crops can be grown while the land is being prepared for autumn sowing, incidentally providing feed which, except in moist summers, assists in finishing off lambs and providing flushing feed for ewes.

In years when eczema may occur crops provide safe feed for all sheep during the dangerous period, which unfortunately usually coincides with the period when ewes need the best feed that can be provided to ensure a good lambing. There seems to be a good case for summer crops

HEADING PHOTOGRAPH: In years when facial eczema may occur crops provide safe feed for all sheep during the dangerous period, which unfortunately usually coincides with the time when ewes need the best feed that can be provided to ensure a good lambing.

MORE EGGS!

. . . EVEN IN WINTER . . .

Read the letter quoted below, from Mr. W. R. Wilson of Herbert who wrote to us on June 29

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What made me think the birds were fond of it, I put a block out in front of a shed for my hoggets. Well, the hens were never away from it, so I put a block in every shed, and the results are amazing. Even the older birds have come up 20 per cent.

To get over 500 eggs from 900 pullets in winter with no lights is extra good, so once again thanks to your 'Molactrate'."

[*National Publicity*

The improved pastures resulting from aerial topdressing and closer subdivision of pastures should enable lambing percentages on hill country to be increased considerably.

on fat lamb farms where all the pastures are not producing well and in the drier areas.

In the moister areas and in all areas if the season is not too dry, much can be done without cropping by closing fields for flushing the ewes. This is generally automatically done because of the need to restrict the diet of ewes after weaning to keep them from getting too fat. With early weaning, as advised by the Department of Agriculture Ruakura Animal Research Station, the chance of accumulating supplementary feed for flushing is much greater. The usefulness of this saved feed does not appear to be as fully appreciated as it might be, though the research work at Ruakura in pointing out anew the value of it is stirring much interest.

Management on Hill Country

On the hills it is far less difficult to keep ewes down in condition after weaning than it is on fat lamb farms. They can readily be checked from becoming too fat by using them to graze areas of rough growth and places subject to infestation with secondary growth. This does automatically result in some feed on the better pastures being reserved, which, however, is well taken care of by lambs and young cattle or cattle being brought forward to good store condition for sale. Consequently, very little feed becomes available for flushing the ewes, except in moist climates or where the pastures are superior to general pastures. Except, therefore, in the moister climates there is a case for the provision of a crop for summer feeding.

One advantage of the chou moellier crop is that it can be left for autumn or winter feed if it is not needed in summer.

Generally cattle and sheep on the hills are short of winter feed, and crops of swedes and chou moellier are commonly grown for this purpose. In moist climates after the crop is eaten off the area can be satisfactorily regrassed in spring. In drier districts spring regrassing is not as satisfactory as sowing down in autumn; with the latter practice a supplementary crop such as soft (white-fleshed) turnips can be sown to be grazed in summer instead of the land being left idle to grow weeds.

On the hills of Raglan County, which are drier than most other areas of South Auckland, rape usually ripens well and this crop could be used for lambs and flushing ewes; chou moellier or soft (white-fleshed) turnips can be used on all areas. One advantage of the chou moellier crop is that it can be left for autumn or winter feed if it is not needed in summer. A little extra winter feed never goes wanting on the hill country or anywhere.

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Shelter for Horticultural Crops in Hawkes Bay

By C. L. NAPIER,
Horticultural Instructor, Department of Agriculture, Palmerston North

THOUGH Hawkes Bay is an ideal district in which to produce an abundance of horticultural products, at certain times of the year it experiences strong winds that can seriously affect crops. Pip and stone fruit orchards comprise perhaps the largest area requiring shelter, but crops such as vegetables and berry fruits and nurseries also benefit when suitable shelters are provided. As very little natural shelter is available, particularly on the Heretaunga Plains, artificial shelter is desirable if crops are to reach maturity without damage. In this article reasons for shelter, types and kinds to plant, and propagation and maintenance are discussed.

IN Hawkes Bay most pip and stone fruit orchards are protected by shelter trees that normally give adequate protection. The same cannot be said about berry fruit and vegetable areas, and in some instances nurseries, many of which are completely exposed. Shelter is necessary to protect crops from winds and to provide the best conditions for the maturing crop. Fruits are more dependent on good conditions than vegetables, because if they are not protected, pollination and fertilisation of flowers may be reduced or prevented. Strong winds can prevent flights of bees and thus reduce pollination. The same winds can buffet blossom, and if cold, can affect the viability of pollen and also reduce the efficiency of bee activity. Winds can also cause desiccation of foliage and checking of growth, thereby causing all types of plants to be unhealthy and unthrifty.

During fruit development strong winds can cause damage to fruits and in extreme cases blow them from the plants. Berry fruit growers in Hawkes Bay have had considerable quantities of fruit damaged and torn by prickles as the plants are buffeted by the wind.

Though vegetables probably suffer from wind less than the plants mentioned, a sheltered atmosphere with its comparative warmth has a very beneficial effect on the crops.

Planning of Shelter

Before any shelter is planted or the plants even purchased several factors should be considered. On new properties it is wise to establish shelter before planting crops. This will ensure successful establishment of the plants and growth will be much more rapid and healthier. If planted about 3 years before crops, fast-growing shelter should give satisfactory protection.

The kind of shelter to plant should be considered in relation to the types of crops, soil types, climate, and the distance away from crops. If the crops are deciduous, for instance, a deciduous shelter would probably be more suitable. The lack of foliage in the winter will allow good aeration of the fruit area. Tall shelter will be required for tall fruit trees and for large areas which can be sheltered by one shelter only.

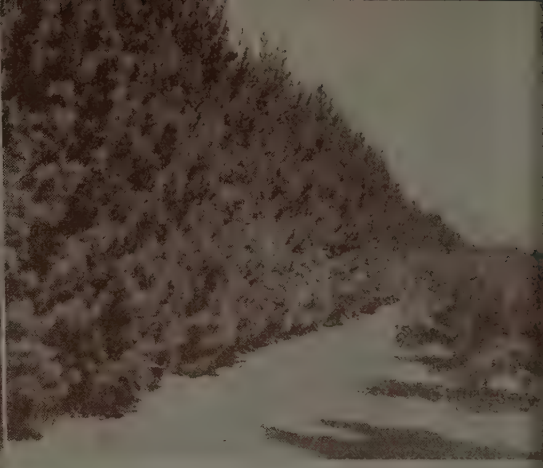
If there is only a narrow headland on areas already planted without shelter, the grower will probably need to decide between a tall shelter and resultant restricted growth of nearby plants or a smaller-growing shelter with a more compact habit. On berry fruit and vegetable areas growers should consider a number of breaks of smaller-growing plants.

Characteristics to Consider

Not all types of shelter are suitable for the purposes for which they are

HEADING PHOTOGRAPH: This *Cupressus benthami* shelter, planted in 1945, was 12ft. high in 1953. Regular annual clipping has given a perfect shelter.

SHELTER SPECIES



Though Hawkes Bay is an ideal district in which to produce an abundance of horticultural crops, the strong winds experienced at certain times of the year can seriously affect crops, and as very little natural shelter is available, artificial shelter such as is provided by the varieties of trees shown here is necessary. Upper left—Black poplar (*Populus seratina*) planted 4ft. apart in 1948 which had grown 16ft. high by 1953. This poplar is most attractive and is a slightly more spreading tree than is Lombardy poplar. Upper right—*Pinus radiata* (at back) and *Pinus muricata* (in front) formed a dense shelter 35ft. high when 7 years old, the age at which they were photographed. Middle left—*Pinus radiata* makes a suitable shelter if clipped carefully. Lower left—A neatly kept *Chamaecyparis lawsoniana* hedge provides main shelter. Lower right—Lombardy poplars with *Cupressus macrocarpa* at their bases form a main shelter.

Photographs at lower left and right by Russell Orr

planted and careful consideration should be given to the factors discussed here.

Restricted root run: Strong-growing plants generally have a vigorous root system, but not all these have spreading roots. This factor should be borne in mind, as spreading roots can check growth of crops and reduce yields. Shallow rooting is another characteristic that can cause trouble, particularly where cultivation is not regular. If deep ploughing is practised regularly close to shelter, surface roots can often be eliminated.

Rapid growth is a desirable factor, particularly where the shelter is planted about the same time as the crop. Topping of shelter is usually done to prevent its becoming too large and difficult to handle later. Though the topping may be done below the level required for effective shelter, rapid growth will ensure a quick return to an effective height.

Lack of spread, or upright growth, is perhaps one of the most desirable characteristics. A compact and upright shelter requires almost no clipping, which means a large saving in time and labour, and takes up very little land. In Hawkes Bay, where horticultural land is highly priced, a wide-growing shelter can mean a large headland and loss of considerable cropping area and therefore a loss of revenue.

Resistance of shelter to diseases and pests eliminates an otherwise important source of infection. In orchards, particularly, shelter belts can act as hosts for aphides, scales, and silver leaf fungus that can spread to fruiting trees. If host plants are used for shelter, disease and pest control should be thorough.

Resistance to drought and excess moisture is a characteristic that should be considered when shelter is being planned. Some kinds of plants cannot stand extremes of drought or moisture and in some localities it may be advisable not to plant these. *Chamaecyparis lawsoniana* is one plant that is severely checked and even killed by either condition. If land tends to be wet in winter, plants such as Lombardy poplar and *Cupressus benthami,* which are able to withstand excessive moisture, should be considered. In general, deep-rooted plants may be best for dry conditions and shallow-rooted ones for wet areas.

Ability to withstand certain types of climate is an important feature, particularly near the coast and also where frosts are experienced. All too often shelters are established that soon become desiccated and stunted by coastal winds and salt spray. Plants that withstand drying winds and salt winds are often those with hairy, or thick, shiny leaves.

Density of growth is often considered the most important factor. Much work has been done overseas on this. In general a shelter belt will provide some degree of shelter for a distance of about forty times its height. One overseas worker has compared the effects of three different types of shelter, namely, those impenetrable to wind, those slightly impenetrable below and impenetrable above, and those partly penetrable throughout their height. In the second type it was found that the velocity of the wind was only 60 per cent. at a distance 20 times the height out from the shelter. This was the most effective type. However, the most effective type for horticultural crops would probably be a combination giving denseness at the base and slight openness above. This type is illustrated in the lower right photograph on the opposite page.

Lombardy poplar used as subsidiary shelter in a commercial vegetable garden.

Pleasant appearance of a shelter belt is a factor not normally considered, though a pleasant-looking shelter adds to the aesthetic value of any property.

Consideration of species: In Hawkes Bay the major deciduous shelter species on horticultural properties is the Lombardy poplar. *Cupressus macrocarpa* and *Chamaecyparis lawsoniana* form the major proportion of the evergreens, with *Cupressus benthami* becoming increasingly popular.

As pip and stone fruit orchards usually cover large areas, it is customary to plant tall-growing shelter belts. This practice usually eliminates the need for subsidiary shelter, the planting of which would reduce the number of fruiting trees. Where subsidiary shelter can be planted growers may prefer to plant lower-growing species that require less maintenance.

Lower-growing types are generally more suitable for berry fruits, vegetables, and nurseries, and where situations are very exposed subsidiary shelter would be an advantage. The illustration above shows poplar shelters in the Hutt Valley, near Wellington. The subsidiary shelters can be renewed at intervals of several years. The original subsidiaries are planted to divide the total area into a number of "bays" approximately 50yds. wide. The poplars are planted close (12in. to 18in. apart) and deep ploughing from establishment onward is regularly done close to the plants to reduce surface rooting. Annual topping to 10ft. to 12ft. and close planting keep the shelter in check and vegetables can be grown within 30in. of the base. When shelters are considered to be getting too large a further series can be planted in between, the old lines being removed when the young plants are 2 to 3 years old.

Though poplars have proved ideal under this system, they have to be removed at intervals. There are, however, species with dwarfer growing habits that could be made into more or less permanent shelters.

SMALL-FRUIT AND VEGETABLE SHELTERS

The shelters shown here are suitable for berry fruit and vegetable gardens. Upper left—*Abelia floribunda* makes a neat hedge for surrounding such areas. Upper right—Golden ake ake (*Olearia fosteri*), a New Zealand native, is a good hedge plant. Middle left—Buddleia will form a shelter quickly, as it is rapid growing, and it will stand hard cutting back. Lower left—*Pittosporum crassifolium*, a New Zealand native, makes a good hardy shelter. Lower right—Privet (*Ligustrum sinense*), showing the powers of regrowth after severe bare-poling.

A number of shelter species have disadvantages that should not be overlooked. *Pinus radiata*, for instance, has a fairly extensive root system, as have other conifers such as *Cupressus macrocarpa*. Also, conifers, need to be trimmed carefully, because if too much foliage is cut away at one time, regrowth will not take place. Macrocarpa becomes very woody and spreading and after a few years is very difficult to keep compact. In general, gums (*Eucalyptus* spp.) are difficult to trim and nearly always remain open and woody.

Chamaecyparis lawsoniana, Chinese privet, tree lucerne, and *Cupressus benthami* are a few that suffer from salt winds if planted in positions exposed to the coast.

Perhaps the most hardy and all-round satisfactory shelter plants are eleagnus, Chinese privet, Tasmanian ngaio, *Cupressus benthami*, and Lombardy poplar. There are, however, a number of others that are quite suitable. In the table below are listed shelter plants recommended for the Hawkes Bay district. These are divided into those most suitable for pip and stone fruit orchards and those suitable for berry fruit, nursery, and vegetable areas.

Tree lucerne makes a fast-growing temporary shelter. From plant height tree lucerne can reach fence height in 1 year, which is a valuable factor in windswept areas. The main value with this species is that it will shelter slower-growing permanent species while they are becoming established. After establishment of permanent shelter the tree lucerne can be removed. A more satisfactory shelter is developed when tree lucerne is grown from seed sown on the shelter site.

Propagation

All the plants mentioned in this article can be raised from either cuttings or seed.

Cuttings

Chinese privet, laurel, tree lucerne, lonicera, escallonia, eleagnus, buddleia, abelia, and ake ake can all be raised from cuttings 12in. to 15in. long. Straight, healthy, 1-year-old wood should be selected in winter. It is usual to take the most mature portion of growths, removing the softer tip and trimming the base to just below a bud. Cuttings should be at least pencil thickness to make vigorous plants.

Cuttings can be planted out in nursery rows in August and September at 9in. to 12in. intervals. They are best planted immediately after they have been prepared. They should be put in half their length in a cut in the soil made along the line with a spade and the soil pressed down firmly about them. A light moulding up to cover half of the length above ground often prevents drying out in spring.

RECOMMENDED SHELTER TREES FOR HAWKES BAY

	Time to form effective shelter Years	Distance to plant Ft.	Average height untopped Ft.	Time of year to clip	Main advantages and disadvantages
ORCHARDS					
Lombardy poplar	3-4	3-6	80-100	Winter	Hardy; reasonably tolerant of moisture; tolerates hard cutting back
Pinus radiata	7-8	9-12	60-70	Spring and autumn	Becomes open at base; cutting must be light; otherwise regrowth will be sparse
Cupressus benthami	6-8	4-6	40-50	Spring and autumn	Tolerates fairly moist conditions; trimming must be light and often and dense growth will result
Chamaecyparis lawsoniana	6-8	4-8	40-50	Spring and autumn	Will not tolerate salt winds, excessive drought, or moisture; trim as for other conifers; subject to attack by cypress canker
Cupressus sempervirens stricta (upright cypress)	5-6	3-6	40-50	Spring and autumn	Resistant to drought and salt winds; narrow habit and hardy; trim lightly only when necessary
Chinese privet	4-5	2-4	20-35	Spring, summer, and autumn	Very hardy and stands severe cutting back; good for subsidiary shelter; endures ill-drained soils
Laurel	5-6	2-3	20-25	Spring and autumn	Very hardy and stands severe cutting back
Tree lucerne	2-3	1½lb. of seed to 100yds.	12-15	Several times a year	Temporary only, but fast growing; host of stem borers and scales
Populus serotina	3-4	3-6	60-80	Winter	Hardy and stand heavy cutting; spread sideways more than Lombardy poplar, but are very attractive; tolerate moisture
Populus yunnanensis	3-4	3-6	60-80	Winter	
Cryptomeria japonica elegans	6-8	6-8	30-40	Spring and autumn if necessary	Tolerates wide range of soil conditions; can be left untrimmed; not very tolerant of salt winds
BERRY FRUITS, NURSERIES, AND VEGETABLES					
Pittosporum tenuifolium	5-6	2-3	15-20	Summer and autumn	Will not stand hard clipping and may become open at base; hosts for scales; excessive moisture may kill, but all tolerate dryness. *P. tenuifolium* best
Pittosporum eugenioides	5-6	2-3	20-40		
Pittosporum crassifolium	5-6	2-3	20-25		
Lonicera nitida	4-5	1½	8-10	Spring and autumn	Hardy and compact; suitable for subsidiary shelter; if very exposed, may be blown over; not completely resistant to salt winds
Escallonia spp.	4-5	1½-2	15-20	Spring and autumn	Good for boundary shelter; stands cutting; may be checked by excess moisture
Eleagnus	4-5	2	15	Trim frequently	Very hardy and stands poor soil, dryness, excess moisture, salt winds, and heavy cutting; not particularly attractive; because of its natural fine scales, which cause irritation, it must be cut when damp
Buddleia	4-5	3	15-20	Spring and autumn	Rapid growth; hardy and stands hard cutting; because of its natural fine scales, which cause irritation, it must be cut when damp
Abelia floribunda	4-5	1½-2	6-10	After flowering	Same as lonicera; attractive
Golden ake ake	4-5	2	20	Summer and autumn	Trimming must be light; is a host of a gall midge; attractive
Tree lucerne	See under orchards.			Can be planted 1ft. apart as well as sown in situ	
Chinese privet *Cupressus benthami*	See under orchards.			Mainly as boundary shelter	

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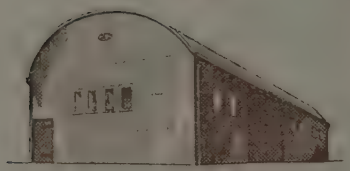

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CASE

Lombardy poplar will grow from cuttings 1½ft. to 6ft. long. If they are long, the wood can be several years old. Cuttings of say 3ft. can go 1½ft. to 2ft. in the soil. Cuttings of yearling wood (particularly of poplars) are probably more satisfactory, as the soft core of older cuttings often breaks down in time, resulting in hollow and unstable trees. Poplar cuttings are best planted in their permanent positions. All other species can be planted this way or, if preferred, raised in nursery rows for 1 year before being planted out.

Seed Propagation

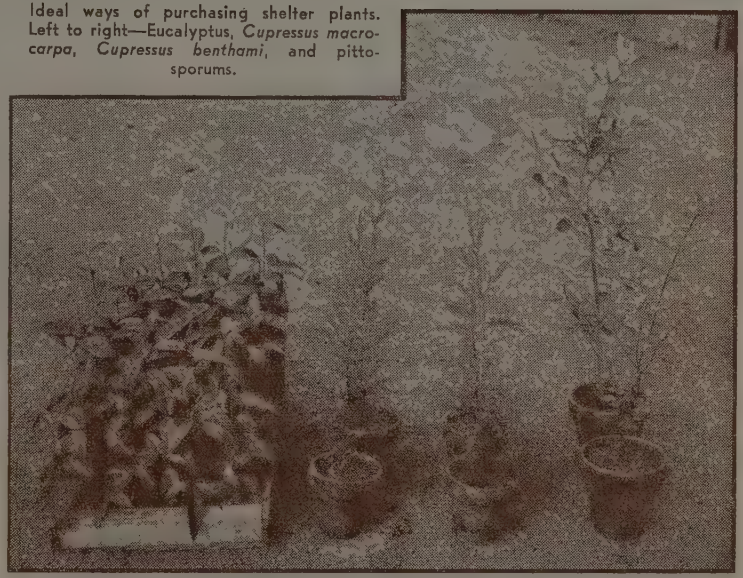
The conifers and pittosporums are more conveniently raised from seed than cuttings. When only small quantities of trees are required it would be more practicable to purchase them from a nurseryman. Larger quantities can be raised in open ground in wide drills taken out with a full blade of a draw hoe. *Pinus radiata* and other conifer seed can be sown thinly ¼in. deep in August or September and should give suitable yearling plants for planting out the following winter. Pittosporums can also be raised the same way. Privet, pines, and pittosporums can also be sown early between layers of damp sand (stratification). This often ensures a greater percentage germination. All species except *pinus radiata* may require growing on the second year in nursery rows before being set out in their permanent positions.

Planting

Planting of shelter trees in Hawkes Bay can be done from June to September, but as soil conditions during the first half of this period are often unsatisfactory, August and September are probably the best months. All shelter trees require treatment similar to any other plants in their early life if they are to grow successfully. This includes preparation of the land, manuring if considered necessary, and weed control after shelter establishment.

All shelter plants should be heeled in after purchase until they are planted out. Before the trees are planted roots should be trimmed where necessary to remove any damaged portions. The holes to take the roots should be large enough to allow the roots to be spread out well. The planting depth should be the same or slightly deeper than when the plants were growing in the nursery. The soil should be firmed well about the plants and slight hollows can be left about their bases to take water if the summer is dry. After planting is finished it is advisable to cut back most plants to encourage bushing out of their bases and quick establishment. Deciduous plants can be cut back to two-thirds their height and evergreens, particularly conifers, can have their tips lightly pruned.

Pittosporums and conifers (except *Pinus radiata* and related species) normally transplant more successfully when raised in pots. The plants can then be knocked carefully from the pots and planted without any check to their roots. The best available alternatives to pots are boxes. A week or two before being planted out the plants can be watered and if necessary, cut out in squares with a knife. They should recover before being planted out.



Ideal ways of purchasing shelter plants. Left to right—Eucalyptus, *Cupressus macrocarpa*, *Cupressus benthami*, and pittosporums.

When conifers from nursery rows are planted they are more successful if planted out as yearlings. All evergreens should also be wrenched in the nursery row before being lifted. This is done by passing a spade beneath the plants at an angle of about 45 degrees from both sides so that the cuts meet in the middle beneath the trees. In this way the check to the roots is suffered before the trees are planted out.

Trimming

Light trimming of most shelter species is desirable when they are young to encourage density of basal growth. Trimming of all conifers should be light and regular; otherwise they tend to become open. Conifers in general do not recover from severe pruning and this is evidenced by many *Pinus radiata* shelters in the district.

Most shelters can be trimmed with either vertical sides or sloping sides so that they form an apex at the top. When sides are trimmed vertically growers should guard against trimming too hard at the base. If this is done year after year, the base tends to become narrower and more sparse than the top. On berry fruit and vegetable areas trimming hedges so that they taper to an apex is desirable. The shadow cast by such a hedge is less than that cast by one of the same height with vertical sides. In restricted areas less shade would no doubt be an advantage.

Topping of shelters should be governed by their vigour and the crops being sheltered. They should always be topped as soon as the desired height has been reached, because the work becomes more difficult later.

Growers in Hawkes Bay, particularly those raising berry fruits and vegetables, would do well to consider more shelter about their properties, but before doing so they should give careful thought to the type needed and the crop to be sheltered. Growers are referred to the "Journal of Agriculture" for August 1952, in which reference is made to the legal requirements regarding shelter planting.

Danger to Stock

Some plants used as shelter are poisonous in varying degrees to stock. Where these are grown adjacent to pasture growers would be wise to destroy all clippings to prevent possible stock illness. The following plants used for shelter are poisonous: Laurel (*Prunus laurocerasus*), New Zealand ngaio (*Myoporum laetum*), and yew (*Taxus baccata*).

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J. E. Hume and F. L. Bailey, "New Zealand Journal of Agriculture", vol. 85, p. 135, 1952.

J. S. Yeates, Massey Agricultural College Bulletin No. 12, "Farm Trees and Hedges".

H. E. Connor, New Zealand Department of Agriculture Bulletin No. 356, "Poisonous Plants in New Zealand", 1952.

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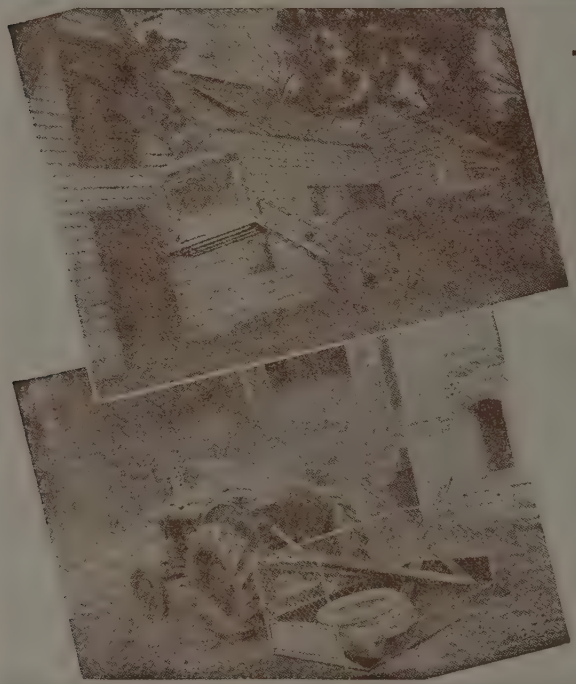

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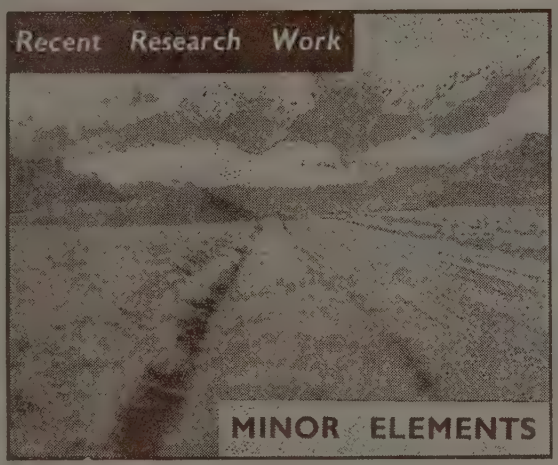

THE large improvement in fertility brought about by the use of molybdenum on many soils has intensified the search for other minor-element deficiencies. The Extension Division of the Department of Agriculture has now in operation 15 mowing trials and 650 observational trials investigating molybdenum responses on pastures and 5 mowing trials and 160 observational trials to test responses from other minor elements on pastures.

MOLYBDENUM

A number of soils have been added to the list of soils responsive to molybdenum on the evidence of pasture topdressing trials. These include many hilly clay soils of North Auckland, some hill soils in the Wairarapa and Raglan and Kawhia Counties, soils derived from old sand dunes, some of the "pakihi" soils of the South Island, and a number of volcanic soils in the North and South Islands. It is becoming obvious from trial results that on the hill soils of the southern part of the North Island variations in molybdenum responses occur because of soil differences which are at present unmapped. Efforts are being made to define these unmapped differences of soils so that the trial results can be applied to the largest area possible.

Other important information on molybdenum can be summarised as follows:—

Two and a half ounces per acre of sodium molybdate may not be enough to obtain worthwhile responses on some soils, particularly on those derived wholly or in part from volcanic parent material and with a high clay content.

Though in general the use of molybdenum is expected to reduce the rate at which lime needs to be applied, there are many soils on which quite heavy liming is essential before sodium molybdate applied at 2½oz. per acre will give beneficial results.

Experiments on hill country near Palmerston North, however, are showing that 3cwt. of lime per acre combined with superphosphate and molybdenum gives excellent results. As such light rates of lime can be applied by air, these findings are of considerable practical importance.

Experiments are now being conducted to examine more closely the relationship between rates of molybdenum and rates of liming.

COPPER

Copper responses on pastures have been obtained in comprehensive minor element trials on a podzol derived from aeolian sand and on a mature podzol north of Auckland. Pastures on peat soils at the Department of Agriculture Rukuhia Soil Research Station have also shown responses to copper.

HEADING PHOTOGRAPH: The Broken River area in the Cass district, Canterbury. Sulphur and molybdenum responses have been obtained on similar country.

SULPHUR

Sulphur deficiencies are now shown to be widespread, and the remedy for these deficiencies is of major importance to agriculture in New Zealand. Gypsum, fine elemental sulphur, and superphosphate and its derivatives are suitable sulphur fertilisers. Most soils contain adequate amounts of sulphur in the organic fraction (humus). This sulphur is thought to become available to plants only by action of bacteria which convert the unavailable organically bound sulphur into more simple inorganic sulphates.

Districts in which prolonged dry weather reduces the activity of soil bacteria are the ones in which sulphur responses have been most prominent. These are Central and North Otago and parts of Canterbury. Sulphur deficiencies are also found on soils in which organic matter and hence total sulphur are very low, such as the soils derived from Tarawera ash and on new alluvial silt deposits. A considerable quantity of sulphur is received from salt spray by soils close to the sea.

ZINC

The only indications of zinc responses on pastures are on some recent soils derived from aeolian sand and on a peaty loam on fine, water-sorted pumice near Te Aroha. If it can be demonstrated that zinc deficiencies are common to a number of pumiceous peats, zinc salts would become a topdressing material of some importance to the Waikato. At present, however, there is no evidence that this is the case.

MANGANESE

Present experimental results indicate that manganese is not destined to play a large part in pasture fertilisation in New Zealand. There is a possibility, however, that it may be of some benefit in certain small areas such as the soils derived from volcanic ash ejected from Mt. Ngauruhoe.

MAGNESIUM

Magnesium may tend to have a slight but beneficial effect in reducing soil acidity to the benefit of pasture growth in trials on very acid soils. This appears to be so in a trial in the Marlborough Sounds. A good growth response, however, which can definitely be attributed to magnesium, has been recorded on a heavily limed soil near Palmerston, Otago.

VANADIUM AND TUNGSTEN

Nearly 30 trials are in progress for examining the roles of vanadium and tungsten in pasture production with and without the addition of molybdenum. Trials with tungsten were laid down because tungsten's chemical behaviour is very similar to that of molybdenum. Vanadium was tried to find an explanation for the superiority of basic slag over other phosphatic fertilisers, which is a feature of certain soil types. Basic slag contains substantial amounts of vanadium. Good visual pasture responses to vanadium have been recorded in a few field experiments near Kaitaia on soils responsive to molybdenum.

It is doubtful whether superphosphate plus vanadium has been better than superphosphate alone, but vanadium with molybdenum (at 2½oz. of sodium molybdate per acre) and superphosphate appeared in several instances better than molybdenum and superphosphate alone. These trials, however, so far give no reason to believe that true vanadium deficiency is occurring or that vanadium is essential to the growth of pastures. It is rather thought that vanadium may influence the availability of molybdenum. Further trials with rates of molybdenum and vanadium should clear this point.

Tungsten has been included in a pasture measurement trial on a highly molybdenum responsive soil near Dunedin. In the absence of molybdenum it has improved pasture growth, but in the presence of applied molybdenum it has had no effect. So far, therefore, its role has been purely one of a molybdenum substitute.

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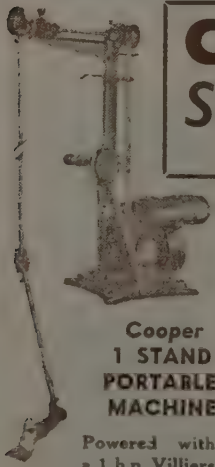

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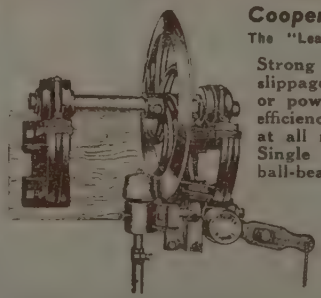

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CERTIFIED seed is the first thought of every wise farmer. Trees are a long-rotation crop and unlike the usual farm crop their hereditary characteristics take proportionately longer in becoming evident. Consequently, to save time, money, and effort a grower should be certain that the best strain is being propagated. Tree seed certification is not established as is certification for agricultural and pastoral seeds, and hence the only safe procedure is to buy seed from a reliable collector or to collect it from good stands.

Preparation of Bed

Any garden soil can be used for the propagation of trees, but a deep friable soil and good drainage are more important in a tree nursery than richness in plant foods. Indeed, an over-rich soil may produce soft, lush growth.

The area to be used for the spring sowing of tree seed should be prepared the previous autumn by deep digging or trenching in the same way as the normal kitchen garden is prepared. Most species are sown in a raised bed about 3ft. wide and of whatever length is necessary to produce the required number of plants. The raising of the surface is done by scooping out the topsoil in the strips which will form the side paths and throwing this soil on the bed area.

The texture of the soil may have to be improved by digging in some organic matter such as straw or sawdust. If these are used, a light dressing of a nitrogenous fertiliser such as sulphate of ammonia will assist decomposition. If coniferous trees are being grown, lime should on no account be applied to the soil. Other fertilisers should be used very sparingly and only if the land is poor.

The soil should be well worked to a fine tilth a few weeks before sowing. The surface should be raked level and free from stones. At this stage the beds should not be walked on if the soil is inclined to cake. Just before sowing a final raking should be given.

Sowing Seed

Sowing should be done in spring (September to October). Large seeds, such as those of oaks or beeches, are sown in drills, but the smaller seeds (the majority of species) are best sown in bands in raised beds. A common practice is the use of three 6in. bands separated by 6in. spaces in a 3ft.-wide bed. The bands are made by laying a 6in.-wide plank along the bed 3in. from one edge and walking on it, thus making a shallow depression with an even bottom. The plank is then moved to a position 6in. from and parallel to the first band and again walked on. The process is repeated for the third band, which should have its outer edge 3in. from the other edge of the bed.

In these bands the seed is spread evenly. The aim is to attain a crop spaced 1in. x 1in., if the trees are to be removed as yearlings, or 2in. x 2in., if they are to stay in the bed for 2 years. This spacing can be achieved with certainty only if the germination capacity of the seed is known. This information can be found by putting a counted number of seeds on damp blotting paper about a month before sowing and noting the percentage which germinate. A rough guide to the average numbers of trees that can be expected from 1lb. of fresh seed is as follows:—

NUMBER OF SEEDLINGS PER 1lb. OF SEED

Species	No. of seedlings
Cryptomeria japonica	10,000
Chamaecyparis lawsoniana (Lawson's cypress)	25,000
Cupressus macrocarpa	6,000
Larix decidua (larch)	6,000
Pinus caribaea	7,000
Pinus laricio	16,000
Pinus muricata	20,000
Pinus patula	33,000
Pinus pinaster	5,000
Pinus ponderosa	4,000
Pinus radiata	11,000
Pinus taeda	7,000
Pseudotsuga taxifolia (Douglas fir or Oregon pine)	15,000
Thuya plicata	60,000

The seed spread in the bands should be firmed by pressure on the board used in making the bands, and the bands should be covered with finely sifted soil or sand. If the soil is inclined to cake, sand is preferable. The depth to which the seed is covered depends on its size. A rough guide is that the cover should be twice the thickness of the seed. Thus fine seed like that of eucalypts should be only just covered, but that of pines should have up to ½in. of cover.

Protection of Beds

In most parts of New Zealand better results are obtained if beds in the

[*New Zealand Forest Service*

Sowing seed in shallow depressions (bands) in a raised bed.

Weeding young trees in a bed. The protecting frame, from which the scrim has been removed, is propped during the process.

early stages are protected against drying by sun and wind, against unseasonable frosts, and against loss of seed by mice and birds. Protection is usually afforded by the use of frames having sides and ends of 6in.- to 8in.-wide boards over which is stretched coarse wire netting. The netting is covered with open-weave scrim, leafy branches, or slats, the covering being kept from blowing off by wires stretched from end to end.

Protection of this sort tends to produce conditions similar to those on the forest floor and at the same time combats the ravages of mice and birds. The result is a better strike and a bed which does not require watering, except perhaps in an unusually dry spell.

Later in the growing season the young trees have to be hardened off. This is done by raising one side of the frame for a short time each day, the time of exposure being extended gradually until the frames can be removed completely. The final exposure is best reserved for a dull or a wet day.

Where seed has been sown too thickly or when conditions are humid it is desirable to begin the lifting of frames early to counteract damping-off (death of seedlings through attack by fungi). Regular weeding is an extra precaution against this trouble.

Weeding is necessary throughout the period from the sowing of the seed to the lifting of the young trees. Certain hormone weedkillers are claimed to be safe for application among conifers, but they should be used with caution. The surest method is to weed by hand.

EDITOR: A. G. G. HILL

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CONTENTS OF VOLUME X, NO. 1, 1955

1. Presidential Address — Prof. P. A. Linehan.
2. The Grasslands of Belgium — H. Reyntens and A. Van Slijcken.
3. Studies in the Digestibility of Herbage — W. F. Raymond, C. E. Harris and C. D. Kemp.
4. The Digestibility and Feeding Value of a Lucerne/Timothy Sward Ensiled in Four Ways — G. L. Bailey, C. C. Balch and J. C. Murdoch.
5. The Effect of a Sub-Clinical Worm-Burden on the Productivity of Sheep — C. R. W. Spedding.
6. Laboratory Studies on the Initiation of the Silage Fermentation by Means of Whey — A. J. G. Barnett and J. Baxter.
7. A Grass-Drier and his Grass — P. M. Hurrell.
8. The Assessment and Recording of the Utilised Output of Grassland — A. S. Barker, A. S. Cray, A. S. Foot, J. D. Ivins, Li. I. Jones, and T. E. Williams.

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Application of Irrigation Water

TO provide maximum pasture growth under irrigation it is essential that the percentage of moisture in the soil should be maintained at a relatively high level. A pasture which is always irrigated in the growthy stage will produce considerably more dry matter per acre than a pasture which is irrigated only when growth shows signs of wilting.

This point has been amply demonstrated in a trial at the Department of Agriculture's Winchmore Irrigation Research Station which compared production yields from a pasture irrigated at approximately wilting point and at a stage approximately half way between wilting point and field capacity. This fact is of particular importance to all irrigators.

There is a tendency with many farmers to delay irrigation (perhaps in the hope that rain will fall) until pastures show obvious signs of dry conditions. Pastures which are irrigated at this stage have not the ability to produce to their maximum or to produce growth quickly.

On dairy farms where spray irrigation is practised spray plants must be used in such a way that feed is made available for the dairy herd when it is needed. Often this may mean that some pastures have to be irrigated while there is still ample feed available for the herd. However, to postpone irrigation in the hope that it will rain could easily mean a substantial drop in production.

Similar conditions apply where flood irrigation is practised. Here the farmer usually obtains his supply of water on a roster system and failure to use the water until conditions become relatively dry could quite easily result in a shortage of feed for stock. On heavily stocked farms it is far better to irrigate and then to get rain than not to irrigate and to run short of feed.

—*G. K. McPHERSON,*
Irrigation Research Officer,
Department of Agriculture,
Ashburton

Advisability of Keeping Male Birds in Household Poultry Flocks

ARTICLES for the guidance of household poultry keepers, who normally have only a limited number of birds, usually describe the management of laying stock—pullets and hens. Little information only is given about male birds. Though not many householders keep male birds, the keeping of such stock has some advantages and disadvantages for owners of small units. Accordingly this article by the Animal Industry Division of the Department of Agriculture discusses the value of male birds to household poultry keepers.

FEW householders breed their own pullets for egg production and consequently a rooster is not often kept. Today, when day-old pullets, perching pullets, or ready-to-lay pullets from good stock can be bought so easily, there is little point in the householder attempting to breed replacement pullets. However, if consideration is given to breeding poultry, the owner of a small unit will do well to remember the difficulty associated with selecting breeding hens of satisfactory quality from a few birds. Brief consideration of the position of the commercial poultry breeder in this respect will quickly emphasise this point.

Under ordinary conditions the commercial poultry breeder selects as breeding hens only some 30 to 40 birds out of every 100 pullets at the end of their first laying year. In other words only about one pullet in three is considered to be worth breeding from on becoming a hen; that is, a bird that has laid for one season and been through an annual or full moult. With male birds the commercial breeder often rears four cockerels for every one retained as fit for breeding. Buying chicks from a commercial breeder, who has the chance to exercise strict selection for breeding, is better than mating every bird of a small unit with perhaps the only cockerel available. The latter practice invariably leads to a mixed batch of pullets being reared and a slow or sometimes rapid deterioration of the stock. Thus a male bird for stud purposes rarely interests the householder.

A rooster kept among pullets when breeding is not practised is of no value, yet cockerels are seen in the hen houses of some householders. Possibly some still believe the myth that the keeping of a male bird among pullets results in more eggs. Actually there are two disadvantages in this practice. First, the cockerel eats food and gives no return and secondly, eggs are fertile. Such eggs are not desirable, particularly if eggs are preserved during spring and early summer for consumption in the following winter. Fertile eggs can deteriorate if preserved and become unfit for consumption when wanted in winter. If a poultry keeper has a cockerel in with his household flock of pullets, it should be taken out.

Cockerels for the Table

Many householders appreciate a good table bird and often complain that they are unable to get a bird which is really tender and appetising. If therefore a householder is prepared to raise a few chickens and has the necessary facilities, why not a few cockerels for the table? For some reason which it is difficult to understand a belief exists that cockerels for the table need a special method of rearing and feeding. Letters to the Department of Agriculture frequently ask how to rear and fatten cockerels for the table.

During the breeding season (July to early October) day-old cockerels are readily available from commercial poultry breeders. Chicks as they are hatched are sexed at a day old, the pullets being retained or sold and a large proportion of the cockerels drowned. It is easy, therefore, to obtain at a reasonable price a dozen or two dozen cockerels in any week during the hatching season. These may be reared in exactly the same way as pullet chicks, with perhaps an infra-red lamp or a small infra-red dull-emitter unit.

Bright-emitter infra-red brooding lamp. One lamp is sufficient for 12 to 24 chicks.

Feeding

Feeding is the same as for pullets throughout the rearing period. The

At left and right—Male birds of two breeds suitable for both egg production and as table birds: Rhode Island Red (left) and Barred Rock (right). Photograph at right by Niederer.

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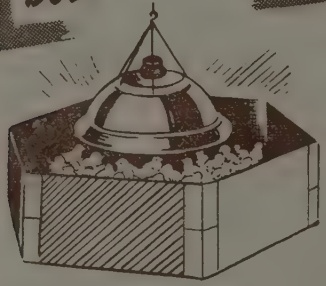

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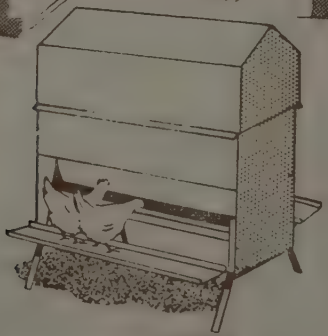

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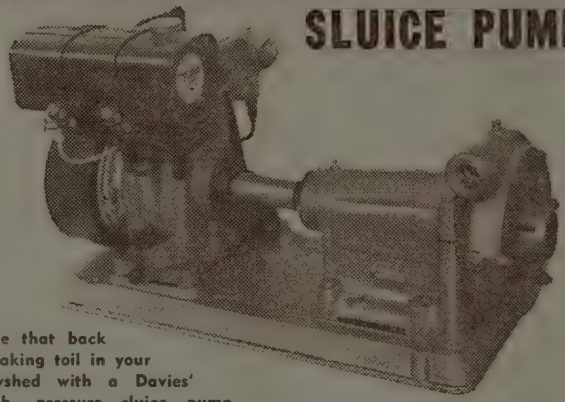

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MALE BIRDS IN HOUSEHOLD POULTRY FLOCKS

better the food given to cockerels the quicker they will grow. The idea that cockerels for the table may be fed on cheap rations is erroneous. Healthy, well-grown, and well-fleshed birds are obtained only when good food is given. The birds require fish oil in their mash to supply vitamins A and D just as much as do pullets. Dry mash and grain may be fed to the cockerels during the brooding period in the first 6 to 8 weeks. Thereafter there is some advantage in changing over to wet mash feeding with only small grain feeds. This change is not essential, but birds fed on wet mash often appear to have a greater "bloom" on the flesh at killing than do birds fed on dry mash. The latter can have a "dry" appearance. Special fattening rations are not necessary.

Breeding pen of Australorps. Cockerels from this breed make heavy table birds.

Age to Kill

When should these cockerels be ready for the table? If crossbred, Australorp, or Rhode Island Red cockerels have been purchased (White Leghorns do not make good table birds), they may be killed when between 14 and 20 weeks of age. Obviously if they are killed at the younger age, they will be smaller birds, but when properly reared they are of excellent quality.

At the age of 14 to 16 weeks cockerels should have a liveweight of at least 3½lb., when they will make a reasonable meal for four people. Such birds require from 30 to 35 minutes' roasting. If they are cooked for more than 40 minutes, the flesh will become too dry. New Zealanders are so used to "chickens" which are pullets or hens at the end of a laying season and require a long period of cooking that there is a tendency to over-cook true chickens, which are quite young birds. Cockerels, particularly those of heavy breeds, will be much larger at 18 to 20 weeks than at 14 to 16 weeks, but their quality will not be as good. They will need 50 to 60 minutes' roasting, but should not require more.

Two points should be watched when the age and quality of a table cockerel are being assessed. First, the spurs should not have developed, but merely be two small swellings or knobs on the shanks. Secondly, the end of the breast bone or keel should feel pliable when a hand is run down it, as this indicates that the end of the keel is still cartilage and not bone. By the time the end of the keel bone is hard the quality of the flesh has started to deteriorate and the bird should not be referred to as chicken in the correct sense that this term is applied to table birds.

Cost of Rearing

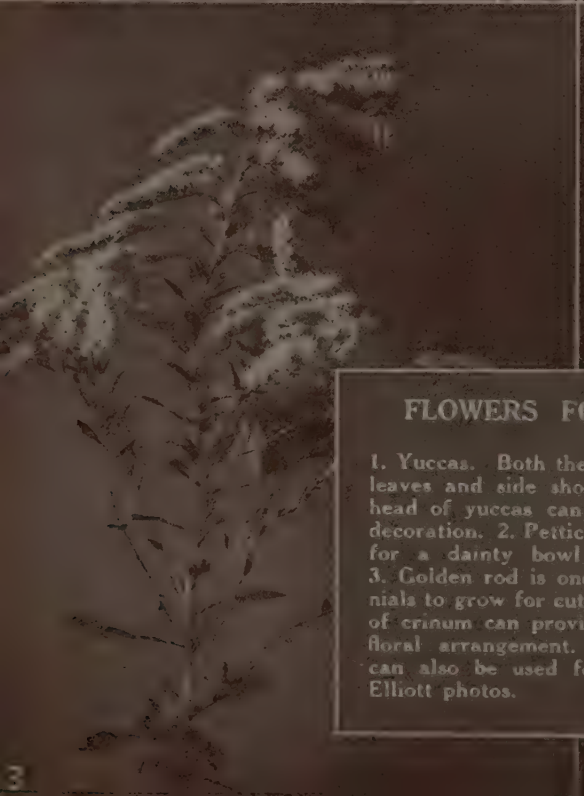
Too often the householder assesses the value of a table bird by its size. This judgment is perhaps understandable, though erroneous, when the price to be paid for a table bird appears to be high. A householder rearing table birds can well afford to kill cockerels while they are still young and tender—say at 16 weeks of age. At this age the birds will have eaten about 17lb. to 18lb. of food each, including grain and mash. If it is assumed that this food costs 3½d. per pound (£29 per ton), the cost for this item is only approximately 6s. Even when the costs of the chick, heating during brooding, and litter are added the cockerel is still not an expensive bird for the table.

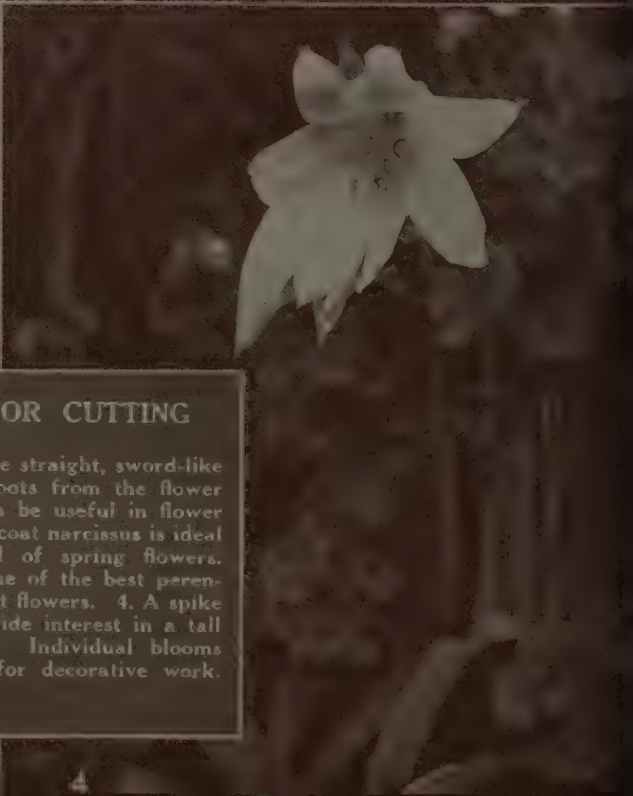
Day-old cockerels bought in September and properly reared should make an appetising and not unduly costly meal soon after New Year.

Special Short Course for Chatham Islanders

FIVE Chatham Islanders recently attended a special short course at Canterbury Agricultural College, Lincoln, which may well have an important influence on farming in the islands. Though the College staff had only an academic knowledge of Chatham Islands farming, the course was a most valuable one for the islanders and provided the College with an insight into the requirements of farmers in the islands.

Those who attended the course are, from left to right, A. Tuutu, J. Thomas, J. Pohio, P. Remi, and P. Tuanui.





FLOWERS FOR CUTTING

1. Yuccas. Both the straight, sword-like leaves and side shoots from the flower head of yuccas can be useful in flower decoration. 2. Petticoat narcissus is ideal for a dainty bowl of spring flowers. 3. Golden rod is one of the best perennials to grow for cut flowers. 4. A spike of crinum can provide interest in a tall floral arrangement. Individual blooms can also be used for decorative work. Elliott photos.

Flowers for Cutting in the Garden

TO have a bright garden full of flowers throughout the year, with ample to cut for home decoration and a surplus to give away, can take considerable time, energy, and money, but there are certain standby plants which will provide a basis to work from and will prove invaluable to the gardener already busy with other affairs. Flowers for cutting are the subject of this article by M. Joanna Lockie, formerly Horticultural Instructor, Department of Agriculture, Auckland. The section on work in the flower garden for October is by K. H. Marcussen, Horticulturist, Department of Agriculture, Christchurch.

IN planning a garden to provide flowers for cutting, plants known to do well in the district should be selected. New kinds, rarities, and oddities may have their places, but it is unwise to rely on them for a regular supply of flowers until they have been tested and tried for several years.

Personal preferences should be followed in what plants to grow, that is if they are suitable, but some of the long-flowering plants should be included even if they are regarded as being ordinary. Shasta daisies, Michaelmas daisies, golden rod, and, in warmer areas, tree daisies and perennial ageratum could come under this description. Any plant which is not unduly affected by disease, is hardy enough to withstand drought, and will carry on flowering year after year with a minimum of attention is worthy of a position in the garden; in times of scarcity its flowers will be more than welcome.

Range of Plants

The wider the range of material grown the better is the selection of flowers and foliage for picking. Bulbs, shrubs, and perennials as well as annuals should be included in the planting scheme. An established garden should always be able to produce a piece of this and a bit of that for a flower arrangement, but the new garden may be found lacking unless the annuals are doing well.

Annuals are useful for a quick and easy supply of flowers, and practically every garden contains stock, poppies, asters, and petunias, but if they are relied on solely for cut flowers, there comes the time when disease, bad weather, or delayed planting results in more or less prolonged periods of shortage. Then the gardener realises the value of a good collection of hardy perennials and a few flowering shrubs.

Shrubs which deserve a position in every garden are wintersweet (*Chimonanthus praecox*) for its scent and winter flowers, *Erica cruenta* (dark red tubular flowers), *Erica melanthera* (mauve bells), *Camellia japonica*, *C. sasanqua*, and *Daphne burkwoodi*. The last named is better than *D. odora rubra*, which has a short life due to virus, especially in Auckland. Waratahs and proteas can replace the wintersweet in northern gardens, but *Heterocentron roseum*, luculia, and poinsettia should be grown only in warm, frost-free districts or in protected situations.

Bulbs which are easy to grow include paper white narcissi for the earliest spring flowers and soleil d'or, the lovely scented yellow jonquil which follows them and comes into flower before the trumpet daffodils.

Dutch and Spanish iris can be relied on for blue, yellow, and bronze flowers, but tingitana iris, though similar, cannot be relied on to flower every year.

Freesias (especially burtoni, the large-flowered white, and coloured hybrids) and the lachenalias (both the yellow and red) are early and prolific flowering. *Iris unguicularis* (*stylosa*) and hellebores are two more winter standby plants. With them can be included the larger bulbs, the nerines with red, pink, and white flowers during March, April, and May respectively, belladonna lilies, *Lilium philippinense*, and Jacobean lilies (*Sprekelia formosissima*). The last named may seem expensive to buy in the first place, but if they are planted in average to good garden soil with half of each bulb above the level of the soil and are left undisturbed, they will flourish and gradually multiply; in addition their flowers last up to 10 days in water.

Among the perennials coreopsis, red-hot pokers, gerbera, rudbeckia, in their glowing reds, yellows, and browns, and the blue perennial scabious (*Scabiosa caucasica*) all deserve a place.

HEADING PHOTOGRAPHS: Left—Michaelmas daisies. Right—Black-eyed Susan. Douglas Elliott photos.

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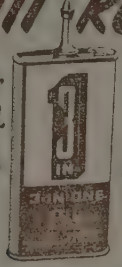

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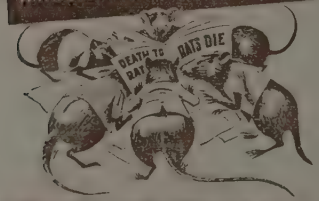

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Maintenance

Where extra-large flowers are required disbudding of dahlias, carnations, and chrysanthemums should be carried out. To do this small side buds should be rubbed out as soon as they are large enough to handle. If a side bud is left to grow on too long before disbudding, an ugly stump is left on the side of the main flower stem.

Staking tall plants, for example, Michaelmas daisies, is often necessary to prevent them bending over during stormy weather and becoming splashed with mud.

Greenery is almost as important as the flowers in some arrangements and again the gardener with shrubs is seldom at a loss for something suitable. Two qualities should be looked for with foliage. Usefulness for cutting, which amounts to colour and form, and length of cut life. Foliage of one distinct colour, of either bold or dainty design, is most useful. Upright, sword-shaped leaves of iris, watsonia, yucca, and flax (*Phormium*) may suit some arrangements. Aspidistra and hosta may suit others; sprays of silver birch, red beech, bronze tips of manuka, and *Grevillea rosmarinifolia* are quite light and dainty. The heavier magnolia, copper beech, and citrus foliage can be used in bold arrangements.

Variegated foliage is not so useful, as it often detracts from the beauty of flowers or the clarity of the arrangement.

Clear yellow and bright red leaves of *Viburnum japonica* or even the glossy green are much used in wired work; the red tips of *Photinia glabra rubens* look well with certain of the rosy red japonicas; nandinas give red and green foliage, and *Spirea Anthony Waterer* white or pink young leaves on growing shoots.

Silver grey foliage of centaurea, senecio, and lavender can be used alone in an arrangement if need be. Autumn foliage when cut for use indoors should not be gathered too late, or all the leaves fall when a branch is touched.

New spring foliage with buds unfolding looks most attractive arranged with spring flowers. Branches of silver birch, quince, prunus, and parrotia, if cut before the colour shows on the buds, will unfold rapidly in water in the house before the outdoor buds are open.

If fern-like foliage is a favourite, the leaves of two perennials, thalictrum and astilbe, are dainty and not unlike fern leaves. Asparagus fern, the climber, is most useful, and foliage of edible asparagus can also be used. Even the common bracken has its uses if there is a shortage of suitable foliage.

Colour

Plants should be selected which will give flowers of colours which match the interior colour scheme. It is most tantalising to look out on a garden full of flowers, yet with nothing suitable to pick, because the colours would clash with tones of the furnishings.

For some gardeners the blues, pinks, and mauves will be the selected colour range for cutting, with perhaps a few red, yellow, or white flowers to improve the garden display. For others red, yellow, orange, and white flowers may predominate, with pink and blue flowers taking second place.

Each gardener and flower arranger should strive to have flowers of the colours they like and which, when cut, will suit the interior colour scheme.

Allergies

Certain flower perfumes are almost too strong, and though pleasant outdoors, may cause discomfort to people when the flowers are cut and brought indoors. The pollen of some flowers and grasses can cause hay-fever. Heavy perfumes of privet, night-scented cream cactus, some of the lilies, and, on occasions, daffodils if there are numbers of them, may cause drowsiness or headaches. Another group of plants sometimes give rise to skin troubles, especially to people subject to them already. Plants which should be avoided in this case are *Ricinus* (castor-oil plant), *Primula*

[*Elliott*

Left—Jacobean lily, though it may seem expensive in the first place, will gradually multiply; its flowers last up to 10 days in water.
Right—Lachenalia, which flowers early and prolifically.

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Method: Cream butter and sugar. Add lemon rind, then egg and beat well. Add sifted flour and baking powder alternately with milk. Grease a basin and add golden syrup or jam. Pour in the mixture and steam two hours. Serve with caramel, velvet or raspberry sauce.

CARAMEL SAUCE

Caramelise 3 level tablespoons sugar. Add ½ pint of milk and stir until the caramel dissolves.
Method: Mix 1 heaped dessertspoon of EDMONDS Vanilla Custard Powder to a smooth cream with ½ pint of milk and stir in the caramel milk. Return to the saucepan and cook until the mixture thickens, stirring all the time. Cook five minutes longer.

RASPBERRY SAUCE

2 Tablespoons Raspberry Jam
½ Pint Water
1 Heaped Teaspoon EDMONDS Cornflour
1 Teaspoon Lemon Juice

Method: Put jam and water into saucepan, bring to the boil. Mix the cornflour to a smooth cream with a little cold water. Pour on boiling jam and water. Return to the saucepan and cook a few minutes, stirring all the time. Add lemon juice.

VELVET SAUCE

2 Tablespoons Sweetened Condensed Milk
½ Pint Hot Water
½ Pint Milk
1 Moderate Tablespoon EDMONDS Cornflour
Vanilla Essence

Method: Stir hot water into condensed milk. Mix cornflour to a smooth cream with the cold milk. Combine the mixtures and cook in a saucepan until the mixture thickens stirring all the time. Cook 5 minutes longer. Remove from heat and add vanilla essence.

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malacoides, and Rhus, though the glorious autumn foliage of the last named is a strong temptation to pick it.

Cutting Flowers

The best blooms should always be cut to enjoy them to the full; poor blooms make a splash of colour in the garden, but lose value inside.

If there is a choice, flowers which hold their heads up well should be selected. Dahlias or gerberas with hanging or drooping heads are hard to arrange effectively. Bent stems, however, are sometimes an asset and may be needed to give the basic line of an arrangement.

Heavy wind just before or while flowers are being cut is just as detrimental to the flowers' keeping quality as is picking in bright sunshine.

Flowers should be cut in the cool of the day and allowed to stand for a few hours in deep water in a cool place before they are arranged.

Secateurs, scissors, or a sharp knife should always be used for cutting flowers. A clean cut on the base of the flower stem absorbs water more readily than a jagged tear. In the cutting of branches of blossom from shrubs or trees it should be remembered that the plant's future shape would be affected and it should not be ruined just for the sake of a vase of flowers. Moderate cutting of flowers as long as each cut is made to a node or side branch will not harm most shrubs. Snapping branches here and there and leaving jagged ends can spoil the appearance and shape of the plant and adversely affect the next season's flower crop.

Keeping Qualities of Flowers

It takes time and trouble to arrange the flowers and an arrangement, unless for a special purpose, should last longer than a day.

Flowers should be watched to see that they are fresh before cutting. Michaelmas daisies, gladioli, and delphiniums are right for cutting when the top flowers are still in bud and the lower ones perfect. When the basal flowers die the tops may be used again.

Full-petalled flowers such as dahlias, chrysanthemums, and the daisy type should have firm, expanded back petals, but certainly not recurved, withered, or browning back petals.

Violets and primroses should have a crisp, firm-textured appearance; any sign of fading or wilting of the petals means the flowers are past their best.

Sweet peas and freesias should be picked when the first flower to open is perfect and the remainder are in bud.

Shrub flowers last longer when the flower stem is of young wood, to get which may mean the use of shorter stems.

Elliott

Among the perennials kniphofia (red-hot poker) deserves a place.

Treatment of Stems to Improve Keeping Qualities

Stems which exude a milky sap, such as those of poppies, poinsettias, and dahlias, should have the end of the stem burnt or plunged into hot water. An inch to 2in. of water should be placed in a wide-mouthed container and care taken to see that each stem reaches the water. The flower heads should be turned to the edge of the container so that the steam does not pass up through the petals and damage them. Too deep water results in "cooked" stems which quickly rot and do not improve keeping qualities. Any "cooked" leaves should be stripped off. Flowers which wilt in a vase may sometimes be revived by cutting off an inch or so of stem at the base.

Garden Work for October

Any work which was not completed last month should be given priority now and it will therefore be useful to read through the notes for September. For flower gardeners in southern districts that will be wise too, as many jobs that were then recommended for northern gardens can only now be carried out in colder districts.

It will be a busy month everywhere, as planting out for floral displays for Christmas and the holiday period should be completed and preparation for late summer and autumn flowering should also be made.

Growth will be intense, both of garden plants and weeds, and attention should be given to both. The hoe should be used frequently; that will keep the weeds down and will benefit the plants by keeping the soil open; furthermore, loss of moisture is lessened when the top layer of soil is kept aerated.

In many districts watering may now have to be done and it is wise to hoe beds and borders as soon as they are dry enough to work.

Bedding Plants

In gardens where bedding displays are a feature planting out of annuals is the biggest job of the month. The beds should be well prepared and an application of a complete fertiliser is generally advisable before planting. Such a fertiliser can be made up by mixing 3 parts of blood and bone, 2 parts of superphosphate, and 1 part of sulphate of potash, all by weight; this should be applied at 2oz. to the square yard.

The distance between plants should be 8in. to 10in. for the smaller types, but for the larger-growing ones, for example African marigold, 18in. is not too much. Whether the plants are to be lifted from a garden plot or from boxes, they should be well watered before being lifted. This should be done some hours before they are required for planting to allow surplus moisture to drain away. On hot days it is best to plant late in the afternoon so that plants will benefit by the cooler and calmer period during the night. Care should be exercised in handling the plants; the more soil that is retained around the roots the easier the plants will become established in the new position. Bedding plants should always be watered after transplanting, and attention should be given to watering for the following week or two.

Late summer flowering bedding plants such as asters, African marigold, cosmos, salvia, and zinnia can be sown in the open in most districts; this will ensure a supply of flowers when many gardens lack colour.

Seed of godetia, clarkia, linaria, cornflower, alyssum, etc., can be scattered in pockets in the mixed border where dull areas may develop when the early subjects have finished flowering.

Polyanthus, sweet williams, and Canterbury bells should be sown now to enable strong plants to develop before winter.

Border Plants

In northern districts the earliest of the herbaceous perennials will be flowering during this month. It is a good rule to cut all spent flower stems down to ground level after flowering. The border will have a tidier appearance and a number of subjects will

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produce a second crop of flowers; pyrethrum, delphinium, and oriental poppy especially will give good flowers later in the season if they are cut down after flowering. Lupins, however, should have only the flower heads removed, as they will produce new flowering shoots from the old stems.

Staking and tying up of herbaceous perennials is a continuous job while they are growing strongly and should not be neglected.

Polyanthus will be drying off in northern districts and the plants with the best-coloured flowers should be retained for next year. These can be lifted and divided; each crown will produce a good plant. They can be planted out in a reserved area during summer. Where pansies and violas have been flowering during winter they will now have developed into spreading plants flowering well away from the centre. They can be trimmed back and if further plants are required, cuttings can be inserted.

Snails and slugs should be watched for continuously and when necessary metaldehyde bait (1oz. of metaldehyde to 3lb. of bran) should be laid.

Chrysanthemums

Chrysanthemums should be planted out before the end of this month. The newer summer-flowering varieties which are gradually becoming available make it possible to have this favourite plant flowering outside in all districts, even where early frosts are expected.

It pays to give chrysanthemums enough space to develop. In a mixed border they should not be planted closer than 18in. apart, nor should they be planted close to shrubs or vigorous-growing perennials. A better display will be obtained if groups of three or more plants of the same variety are planted together; they will then give a splash of colour when flowering.

Dahlias

Dahlias will also be planted in most districts during this month, but they should not be set out while danger of frost exists. Like chrysanthemums, dahlias should be given adequate space to develop; some varieties will spread almost 3ft.

Dahlias grown from seed have become very popular in recent years; it is generally a dwarf type which is used. They are best raised from seed and discarded after flowering, as the plants become too coarse if grown on the second year.

If large clumps are planted or where they have not been transplanted since last season, many shoots may develop. It is not advisable to retain them all; three or four are enough and the strongest and best-placed ones should be left. The remainder should be removed as close to the tubers as possible.

Staking and tying up should be attended to whenever necessary, as the stems break easily.

[*Campbell*

Bedding plants lifted with a good clump of soil will transplant much better.

Gladiolus

Planting of gladiolus should be continued to provide flowers for late summer. A few corms are useful for planting in the mixed border to add colour in a section mainly containing early flowering subjects.

Thrips should be watched for, as they can do much damage to gladiolus, both to foliage and to flowers. These minute insects are not easily observed, but their presence can be detected by a silvery look of the leaves they have been feeding on. D.D.T. or lindane emulsions give the best control.

Tulips

Many plants will show symptoms of virus diseases only when flowering. Tulips are among these. The effect of virus is a broken colour in the flower, and the trouble is commonly referred to as striped blooms.

The bulbs of all striped tulips should be dug up and burnt, as there is no cure for this disease. If left, such plants will remain a menace to the remainder, as virus is spread from one plant to another by aphides.

To assure maximum development of the bulbs for next year the leaves should not be removed before they have died down naturally, but the seed heads should be cut off immediately after flowering, or they will weaken the bulb.

Lawns

Spring growth will still be vigorous and lawns should be cut regularly. Now that frosts are over the edges should be trimmed. This should be done with a sharp spade, or better still with an edging iron, which will give a better cut because it is flat. If edges

are trimmed at an angle of 45 degrees, as shown in the diagram above, they will keep much better. If they are cut straight down, there is always a tendency for crumbling in dry weather, or they may be trodden down when wet.

Weeds should be eradicated while growth is strong to enable the grasses to cover the places which were occupied by the weeds. Hormone weedkillers are effective when temperatures reach approximately 70 degrees F., but great care should be exercised in the application, as any plants growing alongside the lawn will be damaged if hit by the spray. Cleaning of the spray pump must be very thorough or traces of hormone may remain to cause damage when spraying is carried out later.

A method used before hormone weedkillers became known is perhaps better for the home gardener and much safer. It consists of weakening the weeds with a mixture of sulphate of ammonia and sulphate of iron, 3 parts to 1 part respectively. This should be broadcast at 1oz. per square yard on a fine day while the lawn is still wet with dew. The foliage of both weeds and grasses will burn, but after a week or two the grasses will put on fresh growth with added vigour to the detriment of the weeds. A pinch of this mixture can also be placed on the crowns of individual weeds if they are few and scattered.

Roses

Rose plants will now be growing vigorously everywhere and in northern districts flowering will begin this month. The beds should not be allowed to become dry while the buds are developing, and if watering is necessary, it should be done thoroughly so that moisture is made available right down to the feeding roots.

Aphides will be plentiful and spraying should be carried out whenever it is required. Applications should also be made for prevention of fungous diseases such as black spot and mildew. Details of sprays and dusts were published in last month's "Journal".

If specimen blooms are required, disbudding should be carried out as soon as the side buds have developed. Any blind shoots that may develop should be pruned back to the first strong side shoot as soon as it appears.

Attractive Cable-stitch Pullover for Schoolboy

THE attractive cable-stitch pullover illustrated at right would be a warm and comfortable garment for a schoolboy's winter wardrobe. The measurements in the pattern given below are length 22in., chest 36in., and sleeve 20in.

ABBREVIATIONS: K., knit; p., purl; st., stitch(es); rep., repeat; tog., together; beg., beginning; inc., increase; dec., decrease; patt., pattern; cont., continue; rem., remain or remaining

Materials: 9oz. of 3-ply wool: 2 No. 12 and 2 No. 10 needles; 1 small needle pointed at both ends.

Measurements: Length, 22in.; chest, 36in.; sleeve, 20in.

Tension: 1 cable pattern (14 st.) measures 1¼in.

The Front and Back

The front and back are knitted the same. Using No. 12 needles, cast on 136 st. and work in k. 1, p. 1 rib for 3in.

Next row: * Rib 7, inc. in next st. Rep. from * to last 8 st., rib 8 (152 st.).

Change to No. 10 needles and work in patt. thus:—

1st row: * P. 2, k. 8, p. 2, k. 2. Rep. from * to last 12 st., p. 2, k. 8, p. 2.

2nd row: * K. 2, p. 8, k. 2, p. 2. Rep. from * to last 12 st., k. 2, p. 8, k. 2.

3rd row: * P. 2, cable on next 8 st. thus: Slip next 4 st. on spare needle and leave at back of work, k. 4, then k. 4 from spare needle, p. 2, k. 2, p. 2, k. 8, p. 2, k. 2. Rep. from * to last 12 st., p. 2, cable 8, p. 2.

4th row: As 2nd row.

5th to 8th rows: As 1st and 2nd rows.

These 8 rows form the patt. Cont. in patt. until work measures 13½in.

Shaping the Armholes

Cast off 3 st. at beg. of next 4 rows, then k. 2 tog. at both ends of every row until 124 st. rem. Cont. with patt. until work measures about 17½in., ending with 8th row of patt.

Cont. thus:—

1st row: * P. 2, k. 8, p. 2, k. 2. Rep. from * to last 12 st., p. 2, k. 8, p. 2.

2nd row: * K. 2, p. 8, k. 2, p. 2. Rep. from * to last 12 st., k. 2, p. 8, k. 2.

3rd row: * P. 2, cable 8, p. 2, k. 2. Rep. from * to last 12 st., p. 2, cable 8, p. 2.

4th rows: As 2nd row.

5th to 8th rows: As 1st and 2nd rows.

Cont. in this patt. until work measures 22in., ending with a 3rd row. Change to No. 12 needles. Work 2 rows in k. 1, p. 1 rib across all st.

Shaping the Shoulders

Cont. in rib, cast off 9 st. at beg. of next 8 rows. Cast off loosely in rib.

The Sleeves

With No. 12 needles cast on 62 st. and work in k. 1, p. 1 rib for 3in.

Next row: * Rib. 2, inc. in next st. Rep. from * to last 2 st., inc. in each of next 2 st. (84 st.).

Change to No. 10 needles and work in patt. thus:—

1st row: * K. 4, p. 2, k. 2, p. 2, k. 4. Rep. from * to end.

2nd row: * P. 4, k. 2, p. 2, k. 2, p. 4. Rep. from * to end

3rd row: * K. 4, p. 2, k. 2, p. 2, cable 8, p. 2, k. 2, p. 2, k. 4. Rep. from * to end.

4th row: As 2nd row.

5th to 8th rows: Rep. 1st and 2nd rows twice.

These 8 rows form the patt. Cont. in patt., inc. 1 st. at both ends of the 9th and every following 6th row until there are 126 st. Cont. without shaping until work measures 20in.

Shaping the Top

K. 2 tog. at both ends of every row until 60 st. rem. Cast off.

Making up

Press work lightly with hot iron and damp cloth. Join side, shoulder, and sleeve seams. Sew in sleeves. Press seams.

"Barbara Sees the Queen": Mary Scott

IN this book Mary Scott does not depend alone on the topicality of the Queen's visit for the entertaining account of Barbara's latest exploits. So exuberant is Barbara's personality and redolent of the individualism of back-country farming life that she constantly steals the stage, almost even from the Queen herself.

The book comprises 11 short stories, of which "Barbara Sees the Queen" is the first. As the wife of a backblocks farmer Barbara finds fun and merriment on the farm in many circumstances which but for her hilarious handling of them would be humdrum and mundane.

In the same happy strain as the text are the line drawings by Gwyneth Richardson.

—O.N.T.

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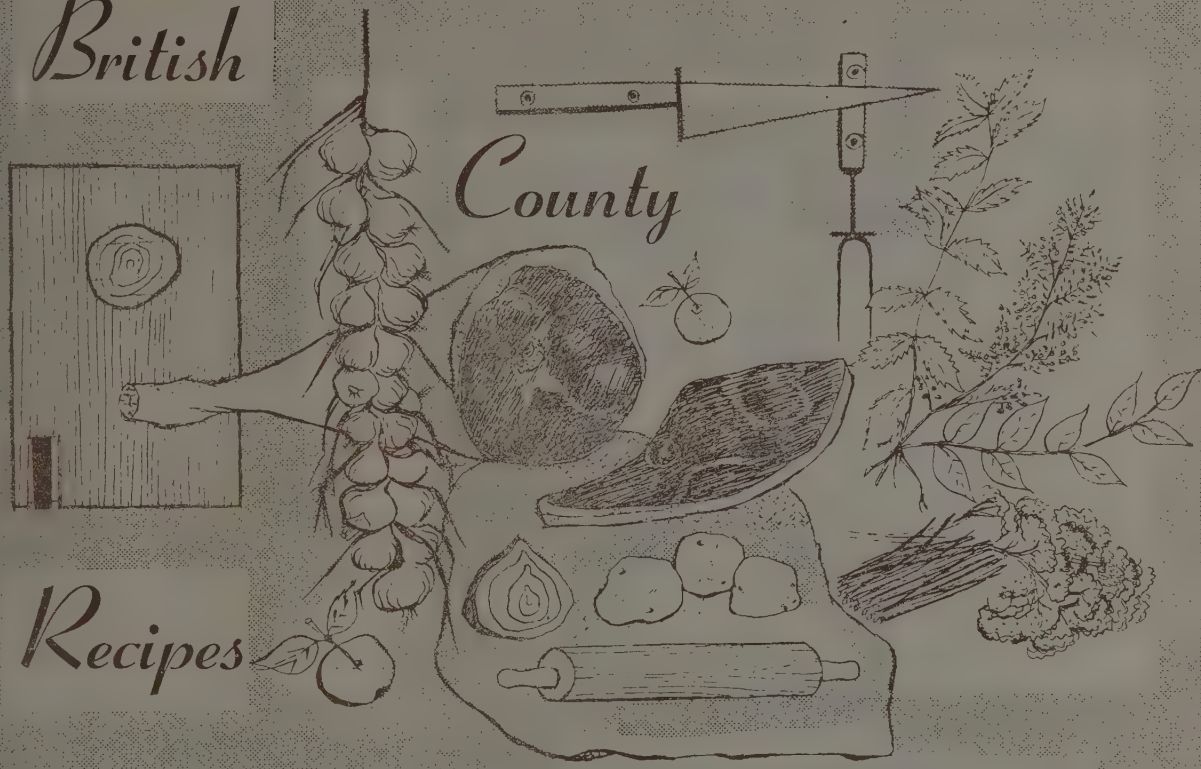
British County Recipes



By DAPHNE EILERS,
Field Officer in Rural Sociology, Department of Agriculture, Auckland

JUST as every country has recipes which are peculiar to it, so different districts in a country also have their own favourite dishes. There are many factors which have contributed to this. The availability of foodstuffs, the climatic conditions, and the type of employment in which the family was involved all affected the daily menu. Today, though a wider variety of foods is available to more people, these traditional dishes are still firm favourites, and the recipes, which have been handed down from generation to generation, hold pride of place in the household recipe book.

MANY of these recipes will be familiar to readers, but there are others which are perhaps not so well known and are worth a trial.

Cornish Pasties

Many people attempt to make Cornish pasties by using up left-over meat and vegetables, but the true Cornish pasty is made from fresh meat. It is important to seal the pastry completely so that steam does not escape and the meat inside cooks in its own juice.

8oz. of short pastry
8oz. of raw beef steak
4oz. of kidney
2 raw potatoes
Salt and pepper to taste

Divide the pastry into six equal portions and roll out each piece to the size of a large saucer or tea plate. Chop the meat and kidney finely and mix it with chopped potatoes. Place the mixture along the centre of each pastry round and sprinkle it with salt and pepper and a few drops of water. Seal the edges of the pastry across the top, fluting with the fingers.

Cook in a hot oven for 15 minutes, then lower the temperature a little and continue to cook for a further 30 to 35 minutes.

Lancashire Hot Pot

1lb. of the best end of neck of lamb or mutton
2 sheep's kidneys
1lb. of potatoes
½ pint of stock
½oz. of dripping
1 small onion
6 oysters (optional)
Salt and pepper

Cut the meat into cutlets and trim off the fat. Put the bones, lean trimmings, and the onion into a saucepan, cover with cold water, and simmer to make stock.

Put a layer of sliced potatoes into a greased fireproof dish and then place the cutlets on top with a slice of kidney and an oyster on each. Sprinkle with pepper and salt and cover with the rest of the potatoes. Pour the hot stock in carefully and brush the top layer of potatoes with dripping. Cover and bake in a moderate oven for 2 hours. Half an hour before serving remove the lid of the casserole and allow the potatoes to brown.

Jugged Hare (Surrey)

1 hare
Pepper and salt
Mace
Nutmeg
12 cloves
1 onion
Small bunch of thyme
Bay leaf
2 cups of gravy
1 glass of red wine

Joint the hare and season with the pepper, salt, mace, and nutmeg. Put the meat into a pudding basin with the bunch of thyme, the onion stuck with the cloves, the bay leaf, the gravy, and the wine. Tie down with a cloth and boil for 4 hours. When cooked take out the liquid and thicken.

Buckinghamshire Leg of Mutton

To give mutton an unusual and piquant flavour allow it to roast in the usual way for ½ hour and then use the following mixture to baste it.

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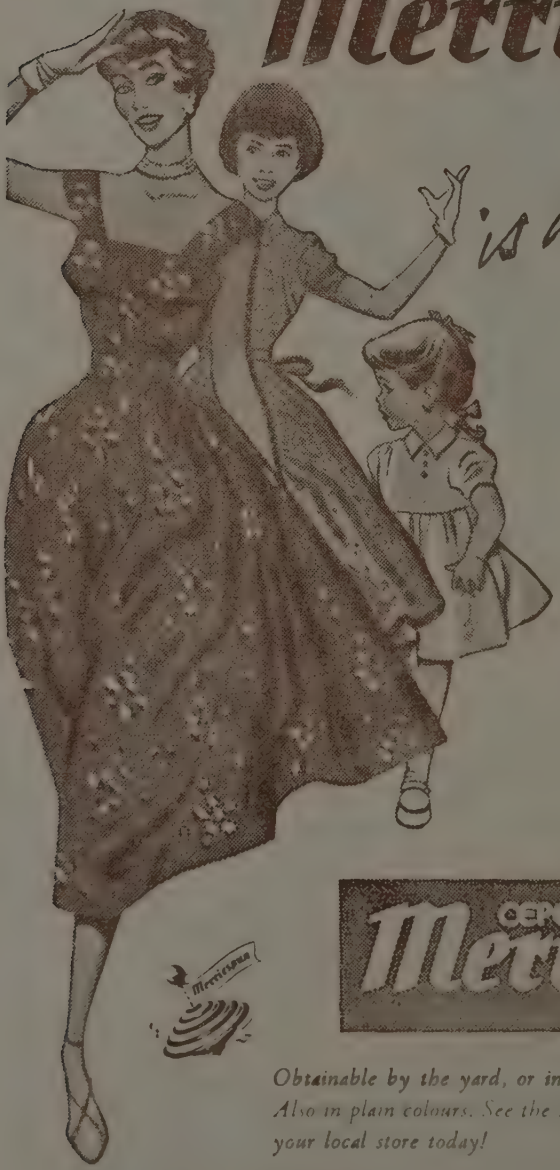

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2 tablespoons of Worcester sauce
2 tablespoons of any other thick sauce
1 teaspoon of anchovy sauce
1 tablespoon of vinegar
½ teaspoon of mustard
2 small onions (chopped finely)

Baste at ½-hourly intervals and serve the remaining liquor instead of gravy.

Yorkshire Pudding

Contrary to the popular practice of serving this batter mixture with roast beef, Yorkshire pudding was formerly eaten with gravy as a separate course. In some country districts in Yorkshire this is still the custom, children being told firmly that they will get no meat and vegetables until they have eaten their pudding.

4oz. of flour
1 egg
1oz. of dripping
Pinch of salt
½ pint of milk

Mix the flour and salt together, drop the egg into the centre with a third of the milk, and beat together to form a smooth paste. Add the rest of the milk gradually, beating well. Allow the mixture to stand covered for at least ½ hour in a cold place. Pour into a heated baking pan in which the dripping has been melted. Bake for ½ hour in a quick oven. The secret of good Yorkshire pudding is to have the dripping sizzling hot in the baking dish when the batter is poured in.

Cornish pasties being prepared. [*Sparrow*

Cumberland Herb Pudding

This pudding is served as an accompaniment to roast beef. It is very tasty and makes a welcome change.

1lb. of young cabbage
A few chives
2oz. of barley (cooked)
1 egg
1oz. of butter
Pepper and salt
A little parsley, mint, and thyme

Chop the cabbage and herbs and cook in a small amount of water for 5 to 10 minutes or until the water has just evaporated. Mix the greens and butter, add the beaten egg and seasoning, and put the mixture into a greased basin. Cover with greaseproof paper and steam for 1 hour.

Lutterworth Tice Tart (Leicestershire)

Pastry

6oz. of flour
2½oz. of dripping
Salt
Cold water

Filling

8oz of tomatoes
4oz. of breadcrumbs
3oz. of grated cheese
1 teaspoonful of flour
Pepper and salt

Make the pastry, roll it out into a circle large enough to line a sandwich tin, and prick it with a fork. Remove the skins from the tomatoes and pulp them. Mix the tomato pulp with the breadcrumbs, cheese, flour, and seasoning. Spread this filling on the pastry and bake in a moderate oven for ½ hour.

Skye Roll

1lb. of minced meat
1 cup of breadcrumbs
1 egg
½lb. of minced ham
1 hard boiled egg (chopped)
Chopped parsley

Mix all ingredients together, form them into a roll, roll it in breadcrumbs, place it in a baking tin with dripping, and bake it in a moderate oven for 1 hour. The mixture can also be packed into a loaf tin for baking, or, if preferred, into a mould and steamed for 2 to 2½ hours.

"'Journal of Agriculture' Cookery Book"

IN the last decade the women's section of "The New Zealand Journal of Agriculture" has contained hundreds of recipes for a wide variety of dishes and foods. The more popular and better known of these recipes have now been selected, arranged under different headings for easy reference, and issued as the "'Journal of Agriculture' Cookery Book".

The book is divided into 17 sections which deal with such subjects as soups, savoury vegetable dishes, fish meals, meat cookery, salads, cold sweets, and puddings and pies. Advice is also given on food planning for health, the preparation and cooking of vegetables, and the carving of different kinds of meat. Both the housewife who has long experience in cooking and the comparative novice will find this book of considerable assistance in the serving of wholesome and attractive meals.

The "'Journal of Agriculture' Cookery Book" is available from main offices of the Department of Agriculture for 5s. 9d. a copy, post free, and from booksellers.

Another delicious variation is to spread the meat mixture on to short pastry, roll it up, and bake it in a moderate oven for 1½ to 2 hours.

Bakewell Tart (Derbyshire)

Many new dishes have been made purely by accident, misinterpretation of the directions, or some other mistake. The following recipe is reputed to have found its origin in such a manner.

8oz. of short crust pastry
2 tablespoons of raspberry jam
2oz. of ground almonds
2oz. of butter
1 egg
Almond essence
2oz. of castor sugar

Cream the butter and sugar until it is thick and light, beat in the egg, add the ground almonds and a few drops of almond essence, then beat thoroughly. Line a flat pie plate with pastry, spread the raspberry jam on it, and put the filling mixture on top. Bake in a quick oven for 30 to 35 minutes.

Two ounces of soya flour may be substituted for the ground almonds, or breadcrumbs would do as well. Extra almond essence must be added in each case.

Coffee Cream (Berkshire)

½ pint of milk
½ pint of cream or evaporated milk
Sugar to taste
5 tablespoons of strong coffee
½oz. of gelatine
Vanilla essence

Whip the cream or evaporated milk until it is very thick, then add the milk and gelatine dissolved in coffee.

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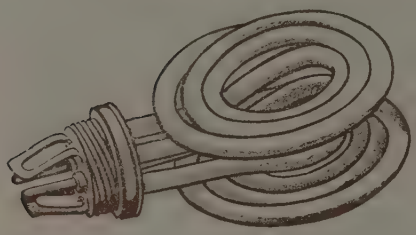

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Dorset Apple Cake

8oz. of flour
2 teaspoons of baking powder
4oz. of sugar
4oz. of butter
2oz. of currants
A little milk
8oz. of chopped apple

Rub the butter into the flour and baking powder. Add the sugar and currants and then the chopped apple. Mix the ingredients together with enough milk to make a stiff dough. Spread this mixture in a greased sandwich tin and cook in a hot oven for 10 minutes, then reduce the heat and cook slowly for 1 hour until the cake is cooked and browned on top. Turn out and cut into slices, butter, and sprinkle with brown sugar. Eat while hot.

Gloucestershire Ginger Cake

10oz. of flour
4oz. of golden syrup
2oz. of treacle
$3\frac{1}{2}$oz. of butter
3oz. of brown sugar
$2\frac{1}{2}$ teaspoons of spice
$\frac{1}{2}$ pint of milk (warmed)
1 egg
1 heaped teaspoon of ginger
1 level teaspoon of bicarbonate of soda

Mix the sugar, spice, flour, and ginger together in a basin. Melt the syrup, treacle, and butter in a saucepan and add together with the beaten egg to dry ingredients. Dissolve the soda in the warm milk and add to mixture while still warm. Mix thoroughly and put into a greased and papered tin. Bake in a moderate oven for $\frac{3}{4}$ to 1 hour.

Banbury cakes and Coventry godcakes. *[Sparrow*

Coventry Godcakes (Warwickshire)

The quaint name of this particular type of mince pie arises from the old custom of children visiting their godparents on New Year's Day and being given these little pies to eat.

Roll 6oz. of flaky pastry thinly and cut it into 4in. squares. Place some mincemeat on one corner of each square, then dampen the edges and fold the pastry over to form a triangle. Press the edges together firmly to seal them and make a fancy edging. Brush over with milk, sprinkle with a little sugar, and bake on an ungreased tray in a quick oven for 15 minutes.

Banbury Cakes (Oxfordshire)

8oz. of rough puff pastry
1oz. of butter
$\frac{1}{2}$oz. of flour
A little grated nutmeg
2 tablespoons of rum or sherry
4oz. of currants
$\frac{1}{2}$oz. of peel
2oz. of brown sugar

Make the rough puff pastry using milk instead of water. Melt the butter in a saucepan, add the flour and nutmeg, and cook for a moment or two. Remove from the heat and add the fruit, sugar, and rum gradually. Roll out the pastry $\frac{1}{4}$in. thick and cut into 5in. rounds. Place a little filling in the centre of each round. Damp the edges of the pastry and draw them together, then turn them round so that the smooth side is on top. Shape into an oval, flatten, and brush with egg white before sprinkling with sugar. Make three cuts across the top of each cake. Place on a greased tray and bake in a hot oven for 20 minutes.

Maids of Honour

These cakes were named by Henry VIII, who once found the Queen's maids of honour eating them. On learning that the cakes had no particular name he said that henceforth they would be known as maids of honour. The secret of their recipe was closely guarded by the original maker, a pastrycook. So that none of his staff would learn the secret he had different people prepare the various ingredients and he alone was responsible for the final combination and baking.

1 pint of milk
1 teaspoon of rennet
Pinch of salt
4oz. of butter
2 egg yolks
1 dessertspoonful of brandy
$\frac{1}{2}$oz. of sweet almonds
2oz. of sugar
Pinch of cinnamon
Half a lemon
Puff pastry

Warm the milk to blood heat and then add the rennet and salt. When the curds have set place in a muslin bag and strain overnight. Rub the curds with butter through a sieve. Beat the egg yolks with the sugar and brandy. Add this mixture to the curds and butter. Blanch the almonds, chop them finely, and add them with the cinnamon to the curd. Finally add the grated rind and the juice of the half lemon. Line the patty tins with pastry, fill them with the mixture, and sprinkle with a few currants. Bake for 25 to 30 minutes in a moderate oven until set and golden brown in colour.

Chelford Chutney (Cheshire)

2lb. of stewed apples
1lb. of large raisins stewed in a little water
2lb. of chopped onions
$\frac{1}{2}$oz. of ground ginger
$\frac{1}{2}$lb. of chopped tomatoes
1lb. of moist sugar
4 chillies
Clove, salt, pepper, and a little cayenne to taste
1 quart of vinegar
$\frac{1}{2}$lb. of vegetable marrow

Place all the ingredients into a saucepan and boil them together with the vinegar for 1 hour. Place in clean jars and seal.

Worcester Sauce (Worcestershire)

1 pint of malt vinegar
2 finely chopped shallots
2 tablespoons of walnut ketchup
2 tablespoons of salt

Mix all the ingredients together and bottle. Shake twice daily for 14 days. Strain and rebottle.

Girl's Gay Cardigan with Long or Three-quarter Sleeves

A CARDIGAN of gay pattern has great appeal for most girls of 8 to 12 years, and such a cardigan, with a pleasing colour scheme, can be made with the materials and instructions given here.

ABBREVIATIONS used are: K., knit; p., purl; st., stitch(es); st.st., stocking stitch; g.st., garter stitch; in., inches; inc., increase(ing); dec., decrease(ing); patt., pattern; cont., continue.

Materials: 8-year-old, 6oz.; 10-year-old, 7oz.; 12-year-old, 8oz. of grey 3-ply wool; 4oz. of red and 2oz. of navy blue 3-ply wool. One pair each of Nos. 10 and 12 knitting needles.

Measurements

Age (years)	8	10	12
Chest (in.)	28	29½	31
Length (in.)	15½	17	18
Length of three-quarter sleeves (in.)	15½	16	16
Length of long sleeves (in.) ..	16½	18½	20½

Tension: With No. 10 needles, 30st., and 18 rows to 4in.

The Pattern

1st to 6th rows: St.st. in grey.
7th and 8th rows: K. in red.
9th to 14th rows: St.st. in red.
15th and 16th rows: K. in grey.
17th to 22nd rows: St.st. in grey.
23rd and 24th rows: K. in blue.
25th row: * K. 2 in grey, k. 2 in blue. Repeat from *.
26th row: P. in grey. Repeat from first row.

The Back

With No. 10 needles and grey wool cast on 102 (110, 112) st. and work 6 rows in st.st. Purl the 7th row, cont. in patt. When work measures 1½in. dec. 1 st. at both ends of every 5th row 3 (4, 4) times. When work measures 4½in. (4½in., 5in.) inc. 1 st. at both ends of every 6th row 6 (7, 7) times. When work measures 10in. (11in., 11½in.) from purled row cast off for each armhole 6 st., next row 2 st., following row 1 st., and the next row 1 st. (same shaping for 10-year-old; for 12-year-old shape armhole by casting off 6 st. first and then 2 st. in the following row, next row 2 st., and finish shaping by casting off 1 st. in following row). Continue straight until work measures 15½in. (17in., 18in.) and cast off for each shoulder 10 st., next row 10 st., following row 10 st. Cast off remaining stitches (for 10-year-old cast off first 10 st., next row 10 st., and following row 12 st.; for 12-year-old cast off 10 st. in first row, 12 st. in next row, and 12 st. in following row). Cast off remaining stitches.

The Left Front

With No. 10 needles and grey wool cast on 58 (62, 66) st. and work 6 rows in st.st. Purl 7th row. Cont. in pattern and cast on 3 new st. at front edge (these 3 st. are worked in g.st. throughout). Dec. and inc. at side edge as given for back. When work measures 10in. (11in., 11½in.) cast off for armhole first row 7 st. (8 st. for 10-year-old; 9 st. for 12-year-old). Cast off 2 st. in third row (all sizes), 1 st. in 5th row, 1 st. in 7th row, and 1 st. in 9th row. When work measures 13½in. (14½in., 15½in.) place 11 (12, 13) st. at front edge on a safety-pin for neck opening. Dec. 1 st. at neck edge until 30 (32, 34) st. remain for shoulder. When work measures 15½in. (17in., 18in.) cast off for shoulder as for back.

The Right Front

Work to correspond with left front, but make 6 buttonholes in front border. Work the buttonholes 6 st. from front edge and 3 st. wide. Make first one in the waist, about 4in. (4in., 4½in.) from purled row at lower edge; remaining buttonholes at intervals of about 2½in. Make 6th buttonhole in neck border, which is worked later.

For Three-quarter Sleeves

With grey wool and No. 12 needles cast on 56 (58, 60) st. and work 1in. in rib of k. 1, p. 1. Change to No. 10 needles and cont. in patt., inc. 4 st. at equal intervals in the 1st row. Inc. 1 st. at both ends of every 6th row until there are 70 (74, 78) st. on the needle. When work measures 10in. (10½in., 11in.) cast off 6 st. at both sides of work, then 1 st. at both ends of every 3rd row 3 times; and of every 2nd row until sleeve measures 15in. (15½in., 15½in.). Then cast off 2 st. in every row until sleeve measures 15½in. (16in., 16in.). Cast off remaining stitches.

For Long Sleeves

With No. 12 needles and grey wool cast on 49 (53, 53) st. and work 2½in. in rib of k. 1, p. 1. Change to No. 10 needles and cont. in patt., increasing 4 st. in the 1st row. Inc. 1 st. at both ends of every 8th row until there are 70 (74, 78) st. on the needle. When work measures 12in. (13½in., 15in.) cast off 6 st. at both sides of work; then 1 st. at both ends of every 3rd row 3 times, then 1 st. at both ends of every 2nd row until sleeve measures 15½in. (17½in., 19½in.). Then cast off 2 st. in every row until sleeve measures 16½in. (18½in., 20½in.). Cast off remaining stitches.

Make-up and Neck Border

Press all parts very lightly on wrong side. Sew cardigan together. Fold back the 3 g.st. at front edge and sew to wrong side. With grey wool and No. 12 needles pick up about 105 st. along neck opening (at back, about 4 rows from cast-off edge), and work in rib of k. 1, p. 1. Make 6th buttonhole in 3rd row straight above the others. Cast off 1 st. at front edge at both sides of work. When border measures 8 rows cast off all stitches.

Fold back purled row at lower edge of cardigan and sew to wrong side. Finish buttonholes and sew on buttons.

Synthetic or Cellulose Sponge for Household Use

By ELEANOR COUSTON,
Field Officer in Rural Sociology, Department of Agriculture, Christchurch

SYNTHETIC or cellulose sponge is now used in the making of several useful household articles such as cleaning cloths, dish mops, and floor mops. The material is hard when dry, but when placed in water it swells and becomes soft and pliable. Its great advantages lie in its high power of absorbency and the ease with which it may be kept clean or sterilised.

Cleaning Cloths

CLEANING cloths are available in several sizes and in a variety of colours. They are effective for use as dish cloths and for cleaning windows and other washable surfaces, and the large size makes a good draining mat when washing up is being done. As they are lint free, they leave no particles of fluff on glass or mirror surfaces. A further advantage is that they can be used in hot water or boiled to sterilise them, whereas chamois-leather can be used only in warm water. They will give long service provided they are squeezed dry and not wrung.

Dish Mops

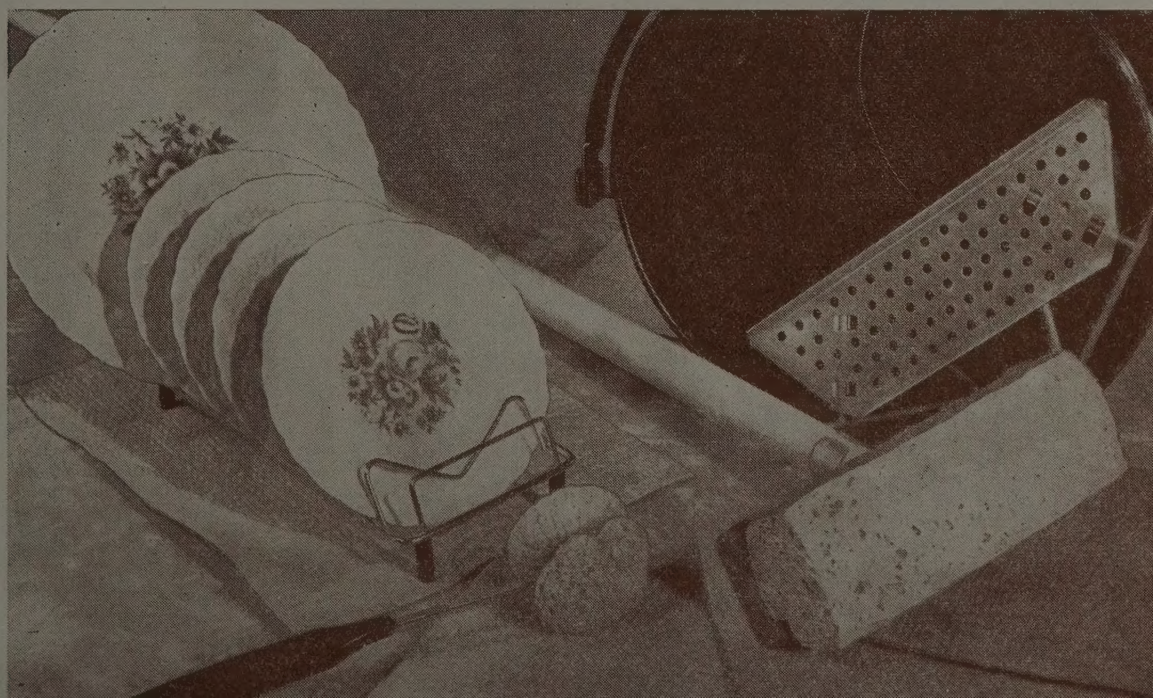
The round-headed cellulose sponge dish mops are excellent for washing dishes and the pliable sponge will reach the interior of glassware, cups, etc. The mop head can be boiled and refills are available. A further use is for cleaning the outsides of windows which are inaccessible with a cloth.

Floor Mops

Two types of cellulose sponge floor mops are available, one having a lever arrangement for squeezing out water and the other having a drainer which can be attached to a bucket. As the mops can be squeezed very dry, it is possible to wash a surface without getting excess water on it. They are fitted to a long handle so that floors can be washed without kneeling or stooping and without wetting the hands.

Because of their compact shape it is possible to reach into corners and to exert sufficient pressure for the removal of more stubborn marks. As they are light to handle, they can be used for cleaning washable walls or for windows, as well as for wet-mopping floors with the minimum amount of effort. They can also be used for shampooing carpets or for polishing floors. The ends of the mop holders are fitted with rubber buffers to prevent paint work from being scratched. Though they are easily cleaned by washing in sudsy water and rinsing, it is possible to remove the sponge head for boiling when necessary.

Above—Cellulose sponge mop being used to clean the inside of a window. Below—Cleaning cloths spread on table, dish mop (left), and floor mop and bucket (right). Oddies photos.



ITALIAN SPAGHETTI

By LESLEY HARDING,
formerly Field Officer in Rural Sociology, Department of Agriculture, Auckland

FOR Italian families pasta, made from flour mixed to a hard, dry dough and then fashioned into various shapes, forms the basis of at least one meal a day. The more commonly known types of pasta in New Zealand are spaghetti and macaroni, and housewives use both as extenders of other foods, especially soup. Macaroni cheese is also a favourite tea or luncheon dish.

ITALIANS generally serve spaghetti with a savoury sauce which has a tomato base and to which meat, spices, and vegetables may be added. As spaghetti and macaroni themselves have little or no flavour, the sauce is all-important and must provide enough flavour for both itself and the pasta.

[*Sparrow*

Long strands of spaghetti can be eaten successfully if they are coiled on to a fork.

Cooking Spaghetti

Long spaghetti should be bought and 1oz. to 2oz. should be allowed for each person. Bring to the boil a large quantity of salted water and place the ends of the spaghetti into it. As the spaghetti softens gently coil the rest of it into the water. Boil it hard for 10 to 20 minutes until it is softened but not overcooked. Tip it into a colander to strain it and pour cold water over it to remove any starch grains which might make it gluey. To warm the spaghetti before it is used place it in a pan with a little cream, butter, or oil and warm it gently.

The Sauce

Two basic recipes for sauces are given here as a guide, but limitless variations are possible and there is no reason why a family should not make a specialty of a sauce they have invented themselves.

In the tomato season extra tomatoes could be pureed and bottled so that a supply of puree would be available throughout the year.

Tomato Puree

4lb. of tomatoes
2 teaspoons of salt
6 peppercorns

Remove the skins from the tomatoes by dipping them into boiling water and then cold water and cut them into pieces. Add the salt and cook them until they are thoroughly soft and thick. Pour the mixture into hot sterilised jars and seal. As an added precaution, it may be necessary to process the filled jars of puree in a hot water bath for 10 minutes.

Sauce No. 1

½lb. of veal, pork, beef, or liver
3 cups of tomato puree
½ a clove of garlic
Dash of cayenne pepper
Salt and pepper
About 4 tablespoons of olive oil (sufficient to cover the bottom of the frying pan or saucepan)

Mince or cut the meat finely and brown it lightly in the olive oil (butter, dripping, or tasteless salad oil could be used instead of olive oil). Add the garlic, tomato puree, and cayenne and simmer the mixture for 40 minutes, adding water if necessary to replace any lost as steam. Before using the sauce season it liberally with salt and pepper. This will provide enough sauce for 6 servings of spaghetti.

Sauce No. 2

4 slices of bacon
2 medium-sized onions
1 clove of garlic
2 cups of tomato puree
1 teaspoon of sugar
Salt and pepper

Dice the bacon and heat it in a frying pan or saucepan until it is crisp. Remove it from the pan and brown the sliced onions in the fat. Add the tomato puree and garlic and simmer for 15 minutes. Add the bacon and sugar and season to taste with salt and pepper. Six servings.

Variations

Herbs and spices can be simmered with the onion and tomato for ½ hour and the mixture added to browned meat and simmered for another 10 to 15 minutes to make a third type of sauce.

Green peppers, mushrooms, celery, carrots, or shellfish can be used to improve the flavour of a sauce.

Serving Spaghetti

Cooked long spaghetti is best handled with two forks, which provide some grip. Pile a serving on to a warmed plate and pour sauce into the slightly hollowed out middle of the spaghetti. Place the plate on the table.

Eating Spaghetti

Sprinkle finely grated cheese over the sauce and spaghetti, choosing a hard dry cheese which grates easily. Parmesan cheese is ideal for this purpose and is obtainable in some Continental-type grocery stores, but is more expensive than the ordinary Cheddar type usually bought. Mix the spaghetti, sauce, and cheese together with a tossing motion, using a spoon and a fork.

Eat the spaghetti by winding 2 or 3 strands at a time around the fork. Experienced spaghetti eaters can manage with a fork alone, but beginners may find it advisable to use a spoon to guide the winding. A voluminous table napkin is necessary to protect the clothes.

Italian spaghetti is quite suitable as a luncheon or tea dish or for a special supper party. More of an atmosphere can be gained if it is served with bread rolls and if a light red or white table wine is drunk with it. Spaghetti can be followed by a meat and salad course, though it is a very satisfying meal in itself. To complete the meal in Italian style raw fruit is eaten for the sweets course.

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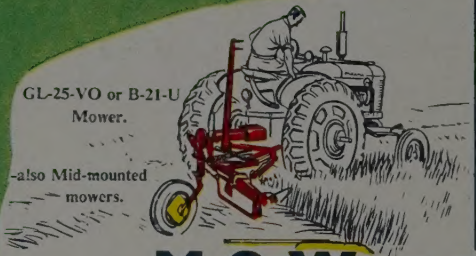

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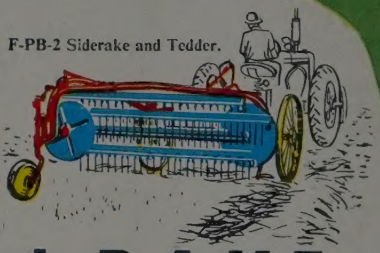

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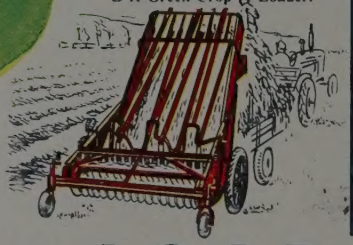

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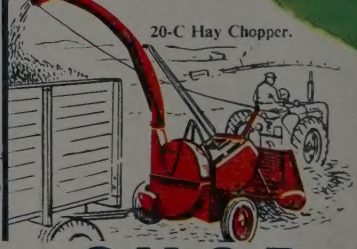

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